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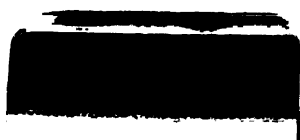
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# ANNUAL *R*EPORT

OF THE

State Engineer *and* Surveyor

OF THE

STATE OF NEW YORK

For the Fiscal Year Ended June 30, 1917

## NOTE TO THE READER

The paper in this volume is brittle or the inner margins are extremely narrow.

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TRANSMITTED TO THE LEGISLATURE JANUARY

ALBANY  
J. B. LYON COMPANY, PRINTERS  
1918



# STATE OF NEW YORK

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No. 9

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## IN SENATE

JANUARY 28, 1918

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### ANNUAL REPORT

OF THE

## STATE ENGINEER AND SURVEYOR

OF THE

### STATE OF NEW YORK

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OFFICE OF THE STATE ENGINEER AND SURVEYOR

ALBANY, N. Y., January 28, 1918.

*To the Honorable the President of the Senate, Session of Legislature of 1918:*

Dear Sir.— I beg to transmit herewith the State Engineer and Surveyor's annual report for the year 1917.

Respectfully,

FRANK M. WILLIAMS,

*State Engineer and Surveyor.*



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The report of the Gaging of Streams for 1917 is published as a supplemental volume, or Vol. II.  
 Vol. III consists of a book of standard Barge canal plans and brief descriptions of methods used in design.





## REPORT

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The report of the State Engineer for the fiscal year of 1917 treats of the amounts expended for construction and engineering up to June 30, 1917. The general descriptive matter, however, is intended to cover the work to the end of the 1917 calendar year.

### THE BARGE CANAL

Barring unforeseen difficulties, the Barge canal will be thrown open to navigation in the spring of 1918. To make this statement in view of the unusual conditions existing in the labor and material markets caused by the war, one must have the utmost confidence in the ability of the contractors to fulfill their contractual obligations and must believe that the Federal Government is vitally interested in seeing the canal completed at the earliest possible moment and will cooperate to that end.

The difficulties attendant on the completion of a work such as this in these trying times are not to be minimized. The congestion on all lines of transportation makes it impossible to predict with any degree of accuracy the time when materials required in construction are to be delivered. No definite assurances can be obtained as to the furnishing of coal in sufficient quantity to meet the contractors' needs, and to retain the labor necessary to carry on the work has appeared at times to be impossible. Construction operations, however, in spite of all these difficulties, have gone on without interruption, and with the assistance of the Federal Government in obtaining deliveries of material required they will continue to go on and the Barge canal will be opened to through navigation in 1918.

The Oswego branch of the Barge canal has been completed.

On the Champlain canal but two contracts remain uncompleted, the work consisting of the excavation of a small amount of material from the bed of the Hudson river, to give the required width and depth in certain sections south of Fort Edward and in the vicinity

of Schuylerville. When navigation opens in 1918 the full depth of 12 feet will have been made available and barges constructed to maximum dimensions intended for the new canal may use this branch of the system. For all practical purposes it can be said that the Champlain canal will be substantially completed by May 15, 1918.

The Erie canal is practically completed between the Hudson river and its junction with the Cayuga and Seneca canal at Montezuma. West of this point the uncompleted work is at the following locations: In the vicinity of Clyde and Lyons on the site of contract No. 47-A; in the vicinity of Rochester, and at Tonawanda. At Montezuma the old aqueduct, which for years has carried the canal across the Seneca river, is being removed to permit navigation to use the new channel, which is constructed in the bed of the river. To those familiar with the old canal and its history, the destruction of the famous Montezuma aqueduct marks the passing of a perfect engineering work at a difficult location, a structure which fulfilled every expectation and which has been a source of inspiration and encouragement to engineers not only of this state but of many others. Such is its history, and its removal at this time reminds us once again of the unusual engineering capabilities of those responsible for the design and construction of the old Erie canal and its first enlargement.

To open the canal to through navigation in 1918 required the completion of a channel within the limits of contract No. 47-A, which is located in the vicinity of Clyde and Lyons. It was evident early in 1917 that unless vigorous measures were adopted this section of the canal would not be finished. After carefully considering the problem in all of its many phases and receiving the counsel of representative organizations throughout the state which were interested in the early completion of the system, the Canal Board, on the recommendation of the Superintendent of Public Works and the State Engineer, directed that the contract be suspended and that the prosecution of this work be intrusted, under the provisions of the Barge Canal Law, to the Superintendent of Public Works, with the forces and equipment which he was authorized to engage for such purpose. This forceful action by the Canal Board was justified by the seriousness of the

danger confronting it; delay in completing this section of the canal meant postponing for one whole year the opening of the entire system to through navigation. The results accomplished during the 1917 working season in progressing this work have demonstrated to the most skeptical the wisdom of electing to follow the course which was followed. On the opening of navigation in 1918 a channel with a depth of 12 feet will be available through this section of the canal.

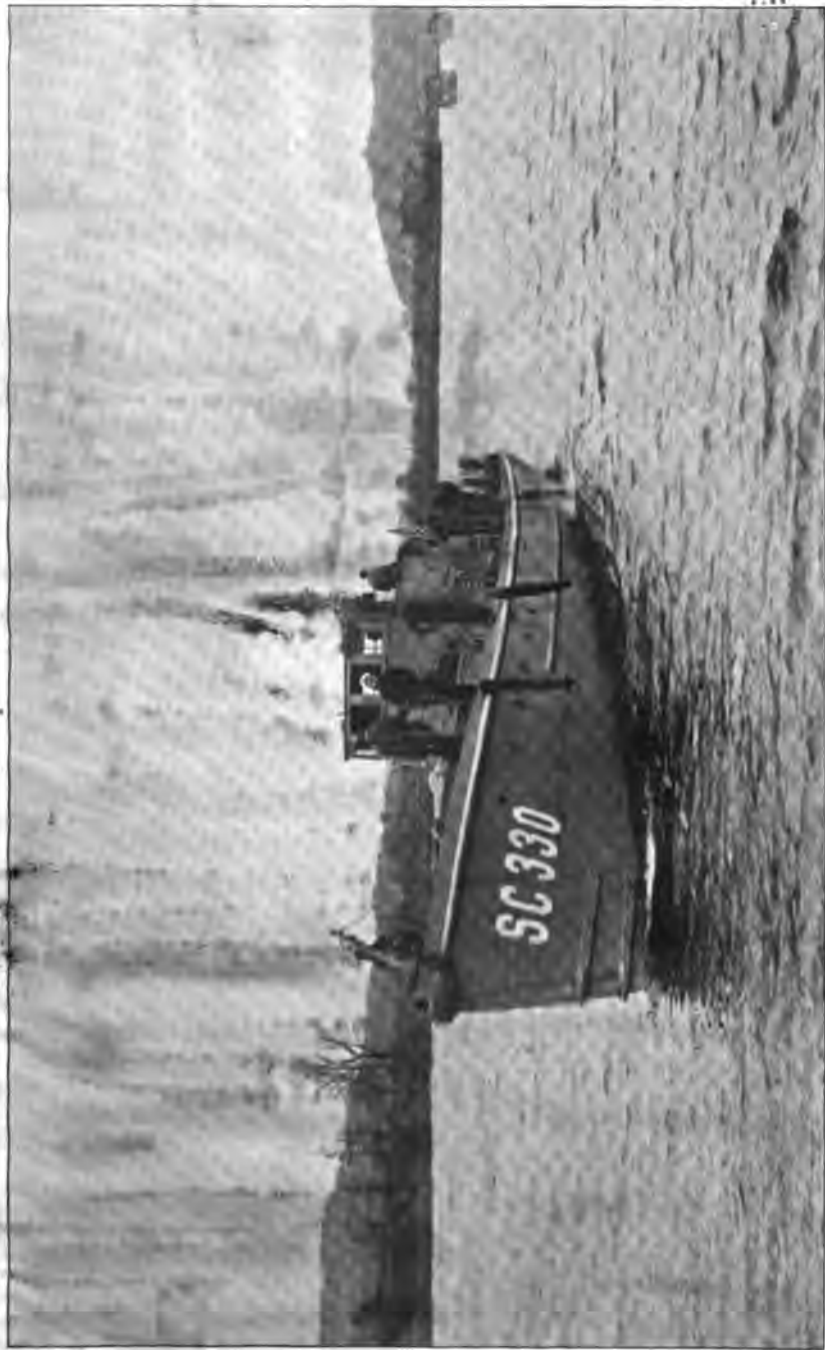
The canal in the vicinity of Rochester now presents the vital point at which will be determined whether or not the through line can be opened with the next navigation season. This work consists principally of the construction of a dam across the Genesee river, heavy excavation through and east of South park, together with the building of a concrete guard-lock, the completion of the concrete trough across the Irondequoit valley and some excavation between this point and Fairport. This is the only locality where there now seems to be any reasonable doubt as to the ability of the contractors, working under adverse conditions, to turn over to the State on May 15, 1918, a channel having the required depth of 12 feet. All of the contractors engaged in the work mentioned above have made carefully prepared statements, showing the rate of progress with which they will carry on their contracts between now and the middle of May. If this rate is maintained, there will be no question as to the opening of the canal on May 15 for Barge canal traffic from Buffalo to Troy.

In planning the construction of the Rochester harbor, which includes a dam across the Genesee river, channel excavation and long retaining walls, it has been my endeavor to provide, first, structures to meet canal requirements, second, such structures as would fit as nearly as possible into the city's plans for flood abatement, and third, to interfere with, to the least possible extent, and to benefit, where practicable, the existing public and private interests in and around the harbor. An exhaustive study of the controlling features and conditions at this point was made, and the entire development was finally determined upon after a series of extended conferences between the representatives of the State, the city, the railroads and the users of water-power. This delayed the preparation of the final plans to such an extent that it was impossible, on account of lack of time, to construct the harbor,

including the dam, before the opening of the 1918 navigation season, so a temporary dam is being constructed and will be maintained in the vicinity of Elmwood avenue during 1918. This dam will give the necessary depth for Barge canal purposes, while the harbor work, which is all under contract, is being completed. In order that the business section of Rochester may have canal service during 1918, connections between the Barge canal and the old canal at points east and west of the city will be made. Thus the old canal route through the city as well as the Barge canal south of the city will be available for shipping purposes for the coming season.

The route of the canal through the Tonawandas presented to the canal officials many of the most complex problems which they have been called upon to solve. The final determination took into consideration all the conflicting interests represented by the State, the municipalities and the railroads. The required details of construction work are: That Tonawanda creek be deepened; that the dam in Tonawanda creek be removed, and a connection made with the Niagara river; that the two lines of the New York Central railroad now crossing the canal be consolidated into one line to cross the canal by means of a movable bridge to be located at the site of the present, so-called, "Peanut Branch" crossing; and that a movable highway bridge be constructed at Webster street. The total number of bridges spanning the canalized Tonawanda creek is thus reduced by one. Minor alterations and repairs to the Delaware avenue bridge and Erie railroad bridge will afford navigation requirements for the present, while the construction details and plans to give unlimited headroom at these bridges are left for future determination. All of the above described work is under contract and progressing at a rate which justifies the definite statement that it will be so far completed by May 15 as to provide for maximum barge navigation.

On the Cayuga and Seneca canal the only work in progress is that in connection with the completion of certain cut-off walls at the locks at Seneca Falls. The full requirements are now assured so far as clearances for navigation at the railroad crossings are concerned. The unfinished prism work consists only in enlargement to full dimensions in the vicinity of some of the railroad crossings, and while this work has not been put under



FLEET OF SUBMARINE CHASERS IN THE BARGE CANAL

Several fleets of various kinds of war craft, built at inland shipyards, passed through the Barge canal in 1917.

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contract, pending necessary appropriations, sufficient time remains between now and the opening of navigation in 1918 to permit the completion of the Seneca branch. The Cayuga branch will be somewhat delayed, pending the completion of the New York Central crossing at the foot of Cayuga lake.

In my last report to the Legislature I called attention to the balance available for the construction of the Cayuga and Seneca canal and stated that undoubtedly future appropriations would be necessary, although at that time it appeared that the construction work might be completed within the original funds, leaving future appropriations to care for damage claims. During the past year the number of judgments handed down by the courts and settlements made by the Special Examiner and Appraiser have exceeded the amount anticipated when my previous report on this subject was made. As a result, the present Legislature must make an appropriation to insure the completion of this branch of the Barge canal. To provide for the remaining construction not yet under contract and to meet contractual obligations already incurred, the sum of \$350,000 should be appropriated.

In my last report it was shown that over \$450,000 was expended in the enlargement of a section of the Chemung canal and in improving the Cayuga lake inlet, neither of which was contemplated when the original estimate was made. This amount covered only the construction charges for these two pieces of work and it should be increased by the engineering, damage and incidental cost items in order to determine the full amount diverted from the original purpose. My last report also gives in detail a statement regarding the change in the plans for building this canal and the subsequent effect of this change on the total cost. Had this additional work and change in plan not been undertaken, the original appropriation would undoubtedly have been sufficient.

The Cayuga and Seneca canal must be opened for use and I therefore urge an immediate appropriation of the amount required to complete this work.

#### *Boats*

During the past year much has been said in the public press as to the lack of boats suitable for use on the new canal. It is true that such a condition exists. There are practically no boats



of a type suited for efficient operation on the new system and few, if any, are in course of construction. When the canal was planned, it was assumed that the boats to operate in its channel would be provided by private capital, and such was the logical conclusion to draw. The war, however, has entirely changed this aspect of the situation, and without definite assurances from the Federal Government that it will coöperate, it seems very doubtful if capital can be attracted to this field until peace returns. This is not surprising, inasmuch as capital cannot now be induced to take up any new transportation scheme unless the Government renders assistance. The unfortunate condition exists, however, that if a decision to help is not speedily arrived at, this splendid canal will not be permitted to play its part as a war resource this coming navigation season, not because it will not be open for navigation, but because there will be practically no equipment to float upon it.

In assuming control of the railroads, the Government becomes supreme in matters of transportation. It can dictate the nature of shipments and the routes to be followed. The first assistance then on the part of the Government to be given private capital interested in the construction of canal barges should include assurance of freight to carry. In view of the railroad situation, this ought to be simple. Anyone who is at all conversant with the subject knows that the cost of shipping by water is less than by rail, and to those who have given the subject deeper study, the popular conception of the slow moving barge as compared to the "fast freight" is known to be erroneous. Tonnage has for years slowly but surely been diverted from the canals of New York state to the railroads. It is not necessary to review the reasons for this, but the canal advocate believes such to be the case, and an examination of the records of the departments presided over by the officials charged with canal matters appears to verify the contention. These are unusual times and business must be assured as long as Government control of railroads continues. After that, the canal will take care of itself. The Government alone at this time has power to act in the matter.

Reasonable time of delivery on materials entering into the construction of barges is for the greater part subject to priority



**MINE SWEEPERS IN A BARGE CANAL LOCK**

Because the Barge canal was ready for use, several fleets of war craft, built in American inland shipyards in 1917, could reach the seaboard through American waters.

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orders. Assurances should be forthcoming from the Government as to the certainty of receiving promptly these materials, and once the barges are placed in commission the owners and operators should feel that they are not to be commandeered for use in other waters.

The boat situation as related to our canals is a serious one. The State, after constructing the canal which connects the Atlantic seaboard with the Great Lakes, should not be expected to build the barges. Millions of tons of freight pass through the state. The canal in 1918 can carry 10,000,000 tons between Lakes and tide-water and thus release thousands of freight-cars for use in sections of the country where inland water transportation has not been developed to the extent it has in New York state. To win the war it has been stated that the United States must build boats, boats and more boats. The result which could be accomplished by placing a limited number in commission on the Barge canal is self-evident.

There are submitted herewith several tables showing the status of the Barge canal work on July 1, 1917, both with respect to the work authorized by chapter 147 of the Laws of 1903, which authorized the improvement of the Erie, the Champlain and the Oswego canals, and by chapter 391 of the Laws of 1909, which provided for the improvement of the Cayuga and Seneca canal. These tables embody information with respect to the date of execution of contracts, the time for completion, the amount of contracts, the amount of preliminary estimate, and the amount of work performed.

Table-I, given below, embraces data relative to all Barge canal contracts under way on July 1, 1917, which have not been accepted as completed, by the State, this table embracing contracts authorized by chapter 147 of the Laws of 1903, and chapter 391 of the Laws of 1909. This table has been subdivided as follows:

*Improvement of the Erie, Oswego and Champlain Canals*

*Chapter 147, Laws of 1903*

(A) Those contracts upon which work is being performed under the terms of the original contract, that is, contracts which have not been suspended nor relet for any cause.

(B) Contracts relet embracing uncompleted work on contracts on which the original contractors defaulted and on which contracts the State will hold the bonding companies and the monies retained from those earned by the original contractors to be applied toward the increased cost of completing the work by reason of such cancellation and reletting.

(C) Contracts relet embracing work within the limits of contracts canceled by the Canal Board due to the failure on the part of the State to place the contractors in possession of the site of the work as contemplated in the terms of the original contracts. On these contracts there is no liability on the part of the original contractors nor the bonding companies to cover any increase in expense by reason of their completion under the terms of the relet contracts.

*Improvement of the Cayuga and Seneca Canal*

Chapter 391, Laws of 1909

Contracts under way on which work is being performed under the terms of the original contract, that is, those contracts which have not been suspended nor relet for any cause.

Table II embraces data relative to contracts completed to July 1, 1917. This table has been subdivided as follows:

*Improvement of the Erie, Oswego and Champlain Canals*

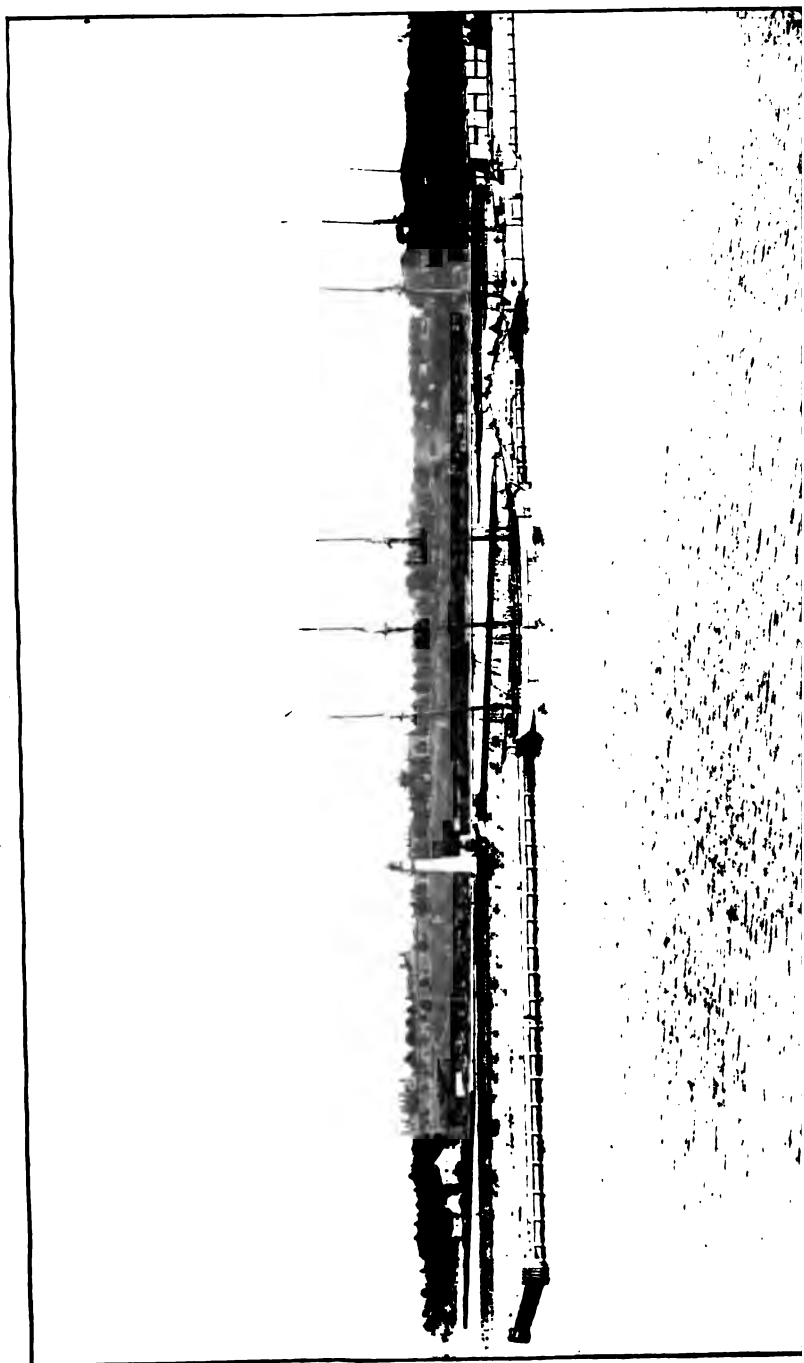
Chapter 147, Laws of 1903

(A) Contracts completed under the original terms.

(B) Contracts completed except for certain incidental work which cannot be performed until immediately preceding the opening of the entire Barge canal system for navigation.

(C) Contracts relet embracing uncompleted work on contracts on which the original contractors defaulted and on which contracts the State will hold the bonding companies and the monies retained from those earned by the original contractors to be applied toward the increased cost of completing the work by reason of such cancellation and reletting.

(D) Contracts relet embracing work within the limits of contracts canceled by the Canal Board due to the failure on the part of the State to place the contractors in possession of the site of the work as contemplated in the terms of the original contracts.



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On these contracts there is no liability on the part of the original contractors nor the bonding companies to cover any increase in expense by reason of their completion under the terms of the relet contracts.

*Improvement of the Cayuga and Seneca Canal*

Chapter 391, Laws of 1909

Contracts completed under the original terms.

Table III embraces data relative to contracts that have been canceled by the Canal Board either on account of the original contractors defaulting or by reason of the State finding it impossible to place the contractors in possession of the entire sites of their work so as to permit the uninterrupted progress thereon. This table has been subdivided as follows:

*Improvement of the Erie, Oswego and Champlain Canals*

Chapter 147, Laws of 1903

(A) Contracts canceled without liability to the bondsmen on original contracts.

(1) Contracts relet and completed to July 1, 1917.

(2) Contracts relet and under way, July 1, 1917.

(B) Contracts on which the bondsmen on the original contracts are held liable, due to the default of the original contractors.

(1) Contracts relet and completed to July 1, 1917.

(2) Contracts relet and under way, July 1, 1917.



TABLE I—CONTRACTS UNDER

Contract No.	CANAL	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed
<b>IMPROVEMENT OF ERIE, OSWEGO AND CHAMPLAIN</b>						
<b>(A) Contracts under</b>						
2G	Erie	1	A. A. Parker	10/17/16	5/1/17	5/1/17
20D	Erie	2-3	American Pipe and Construction Co.	8/18/09	12/31/13	12/31/13
43	Erie	5	The M. A. Talbott Co.	10/15/09	5/1/13	5/1/13
51	Erie	5	The Alto Construction Co.	12/23/10	5/1/14	12/1/14
59A	Erie	9	MacArthur Brothers Co.	11/3/16	5/3/19	5/3/19
72B	Erie	9	P. H. Murray	7/3/16	7/1/17	7/1/17
74	Champlain	1	James Stewart & Co., Inc.	7/7/16	7/7/17	7/7/17
81	Erie	1	Dunbar and Sullivan Dredging Co.	2/13/14	2/13/15	12/31/15
84	Erie	5	Chesley, Earl & Heimbach, Inc.	10/17/16	5/1/17	5/1/17
91	Erie	8	Lupfer & Remick	3/9/17	9/9/18	9/9/18
98	Erie	1	The Holington Co.	1/5/11	9/1/11	1/1/14
99	Erie	10	Tift Construction Co., Inc.	11/24/16	5/1/18	5/1/18
118	Oswego	1	Larkin & Sangster	9/12/16	3/12/18	3/12/18
120	Erie	3	Lathrop, Shea & Henwood Co.	7/29/14	7/29/15	7/29/15
128	Erie	2-3	Whitehead & Kales Iron Works	7/29/14	1/29/16	1/29/16
129	Champlain	2	Holler & Shepard	5/27/16	5/27/17	5/27/17
132	Erie	2	The Foundation Co.	6/6/16	6/6/17	6/6/17
133	Erie	5-6	Lupfer & Remick	11/3/16	5/1/17	5/1/17
137	Erie	4	Morrison & Quinn, Inc.	10/16/16	5/1/17	5/1/17
138	Erie	3	Great Lakes Dredge and Dock Co.	9/18/16	3/18/17	3/18/17
139	Erie	3	J. A. Laporte	10/13/16	8/1/17	8/1/17
141	Oswego	9	Combined Construction Co.	4/19/17	5/3/19	5/3/19
144	Erie	1	H. S. Kerbaugh, Inc.	11/3/16	5/1/17	5/1/17
150	Erie	8	W. F. Maas & Son	3/8/17	12/8/17	12/8/17
153	Erie	9	W. F. Martens & Co., Inc.	6/14/17	12/14/18	12/14/18
154	Erie, Oswego	2	Brown & Lowe Co.	12/1/16	1/12/17	1/12/17
155	Erie	6,1	R. B. Wing & Son	2/28/17	4/1/17	4/1/17
157	Erie	8	Lupfer & Remick	4/7/17	1/7/18	1/7/18
159	Erie	2	Lupfer & Remick	1/31/17	3/31/17	3/31/17
162	Erie	5	Thos. Bowen	4/20/17	5/1/17	5/1/17
	Erie	8	I. M. Ludington's Sons, Inc.	3/27/17	9/27/17	9/27/17
	Erie	9	Charles A. Ingersoll	3/27/17	4/27/17	4/27/17
	Totals					
<b>(B) Relet contracts on which</b>						
42A	Erie	5	Grant Smith & Co. & Locher	2/24/13	1/1/15	1/1/15
70A	Champlain	1	Central Dredging Co.	10/22/12	12/1/15	12/1/15
91A	Erie	1	Lord Construction Co.	11/24/16	4/1/17	4/1/17
122A	Erie	4	Chesley, Earl & Heimbach, Inc.	3/8/17	3/8/18	3/8/18
131A	Champlain	1	M. Fitzgerald	3/5/17	3/5/18	3/5/18
	Totals					
<b>(C) Relet contracts canceled by Canal Board</b>						
1A	Champlain	2	Holler & Shepard	8/31/14	5/31/15	5/31/15
19A	Erie	11	H. S. Kerbaugh, Inc.	11/3/16	11/3/17	11/3/17
21A	Erie	9	Walsh Construction Co.	2/16/16	8/16/17	8/16/17
23A	Erie	9	H. S. Kerbaugh, Inc.	5/20/16	1/20/18	1/20/18
29A	Erie	4	Eastover Construction Co., Inc.	3/27/16	9/27/17	9/27/17
30A	Erie	4	Mohawk Dock and Dredge Co., Inc.	11/24/16	5/1/17	5/1/17
44A	Erie	5	Scott Brothers	10/10/16	5/1/17	5/1/17
46A	Erie	7	James Stewart & Co., Inc.	9/2/14	3/2/16	12/31/16
46B	Erie	7	Scott Brothers	2/25/16	8/25/17	8/25/17
47A	Erie	8	Central Dredging Co.	3/22/16	11/22/17	11/22/17
63A	Erie	9	State Highway Construction Co.	2/23/16	2/23/18	2/23/18
73A	Champlain	1	Great Lakes Dredge & Dock Co.	1/15/16	7/15/17	7/15/17
	Totals					
<b>IMPROVEMENT OF CAYUGA AND SENECA</b>						
<b>Contracts under</b>						
A1	Cayuga & Seneca	1	The Sherman-Stalter Co.	7/24/16	1/24/17	1/24/17
F	Cayuga & Seneca	1	Stanley Construction Co.	7/20/14	1/20/16	1/

Contract No.	CANAL	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed
<b>IMPROVEMENT OF ERIE, OSWEGO AND CHAMPLAIN</b>						
<b>(A) Contracts under</b>						
2G	Erie	1	A. A. Parker	10/17/16	5/1/17	5/1/17
20D	Erie	2-3	American Pipe and Construction Co.	8/18/09	12/31/13	12/31/13
43	Erie	5	The M. A. Talbott Co.	10/15/09	5/1/13	5/1/13
51	Erie	5	The Alto Construction Co.	12/23/10	5/1/14	12/1/14
59A	Erie	9	MacArthur Brothers Co.	11/3/16	5/3/19	5/3/19
72B	Erie	9	P. H. Murray	7/3/16	7/1/17	7/1/17
74	Champlain	1	James Stewart & Co., Inc.	7/7/16	7/7/17	7/7/17
81	Erie	1	Dunbar and Sullivan Dredging Co.	2/13/14	2/13/15	12/31/15
84	Erie	5	Chesley, Earl & Heimbach, Inc.	10/17/16	5/1/17	5/1/17
91	Erie	8	Lupfer & Remick	3/9/17	9/9/18	9/9/18
98	Erie	1	The Holington Co.	1/5/11	9/1/11	1/1/14
99	Erie	10	Tift Construction Co., Inc.	11/24/16	5/1/18	5/1/18
118	Oswego	1	Larkin & Sangster	9/12/16	3/12/18	3/12/18
120	Erie	3	Lathrop, Shea & Henwood Co.	7/29/14	7/29/15	7/29/15
128	Erie	2-3	Whitehead & Kales Iron Works	7/29/14	1/29/16	1/29/16
129	Champlain	2	Holler & Shepard	5/27/16	5/27/17	5/27/17
132	Erie	2	The Foundation Co.	6/6/16	6/6/17	6/6/17
133	Erie	5-6	Lupfer & Remick	11/3/16	5/1/17	5/1/17
137	Erie	4	Morrison & Quinn, Inc.	10/16/16	5/1/17	5/1/17
138	Erie	3	Great Lakes Dredge and Dock Co.	9/18/16	3/18/17	3/18/17
139	Erie	3	J. A. Laporte	10/13/16	8/1/17	8/1/17
141	Oswego	9	Combined Construction Co.	4/19/17	5/3/19	5/3/19
144	Erie	1	H. S. Kerbaugh, Inc.	11/3/16	5/1/17	5/1/17
150	Erie	8	W. F. Maas & Son	3/8/17	12/8/17	12/8/17
153	Erie	9	W. F. Martens & Co., Inc.	6/14/17	12/14/18	12/14/18
154	Erie, Oswego	2	Brown & Lowe Co.	12/1/16	1/12/17	1/12/17
155	Erie	6,1	R. B. Wing & Son	2/28/17	4/1/17	4/1/17
157	Erie	8	Lupfer & Remick	4/7/17	1/7/18	1/7/18
159	Erie	2	Lupfer & Remick	1/31/17	3/31/17	3/31/17
162	Erie	5	Thos. Bowen	4/20/17	5/1/17	5/1/17
	Erie	8	I. M. Ludington's Sons, Inc.	3/27/17	9/27/17	9/27/17
	Erie	9	Charles A. Ingersoll	3/27/17	4/27/17	4/27/17
	Totals					
<b>(B) Relet contracts on which</b>						
42A	Erie	5	Grant Smith & Co. & Locher	2/24/13	1/1/15	1/1/15
70A	Champlain	1	Central Dredging Co.	10/22/12	12/1/15	12/1/15
91A	Erie	1	Lord Construction Co.	11/24/16	4/1/17	4/1/17
122A	Erie	4	Chesley, Earl & Heimbach, Inc.	3/8/17	3/8/18	3/8/18
131A	Champlain	1	M. Fitzgerald	3/5/17	3/5/18	3/5/18
	Totals					
<b>(C) Relet contracts canceled by Canal Board</b>						
1A	Champlain	2	Holler & Shepard	8/31/14	5/31/15	5/31/15
19A	Erie	11	H. S. Kerbaugh, Inc.	11/3/16	11/3/17	11/3/17
21A	Erie	9	Walsh Construction Co.	2/16/16	8/16/17	8/16/17
23A	Erie	9	H. S. Kerbaugh, Inc.	5/20/16	1/20/18	1/20/18
29A	Erie	4	Eastover Construction Co., Inc.	3/27/16	9/27/17	9/27/17
30A	Erie	4	Mohawk Dock and Dredge Co., Inc.	11/24/16	5/1/17	5/1/17
44A	Erie	5	Scott Brothers	10/10/16	5/1/17	5/1/17
46A	Erie	7	James Stewart & Co., Inc.	9/2/14	3/2/16	12/31/16
46B	Erie	7	Scott Brothers	2/25/16	8/25/17	8/25/17
47A	Erie	8	Central Dredging Co.	3/22/16	11/22/17	11/22/17
63A	Erie	9	State Highway Construction Co.	2/23/16	2/23/18	2/23/18
73A	Champlain	1	Great Lakes Dredge & Dock Co.	1/15/16	7/15/17	7/15/17
	Totals					
<b>IMPROVEMENT OF CAYUGA AND SENECA</b>						
<b>Contracts under</b>						
A1	Cayuga & Seneca	1	The Sherman-Stalter Co.	7/24/16	1/24/17	1/24/17
F	Cayuga & Seneca	1	Stanley Construction Co.	7/20/14	1/20/16	1/

# BARGE CANAL.

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WAZ, JULY 1, 1917

1903 estimate as amended in 1915	Engineer's estimate	Original amount of contract	Amount of contract as revised by alterations	Last monthly estimate	Extra work	Total work to July 1, 1917	Contract No.
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CANALS, CHAPTER 147, LAWS OF 1903  
der original terms

0	\$9,688	\$10,779	\$11,770	\$11,260	0	\$11,260	20
\$2,957,015	2,260,000	2,681,040	3,151,104	3,124,610	\$49,421	3,174,031	20D
1,952,069	1,529,885	1,320,560	1,388,080	1,287,780	15,316	1,303,096	43
252,410	424,710	389,843	414,870	353,780	12,017	365,797	51
1,600,000	1,675,253	1,596,789	1,601,279	41,520	500	42,020	59
120,000	124,261	110,689	110,689	71,140	0	71,140	59A
0	207,700	108,540	108,540	91,100	0	91,100	72B
6,600	256,372	240,872	240,872	200,670	0	200,670	74
0	61,236	53,999	54,686	45,680	1,140	46,820	81
173,000	83,984	80,662	83,877	17,520	0	17,520	84
24,807	44,600	42,940	44,985	43,710	0	43,710	91
0	77,497	82,276	82,276	20,250	0	20,250	93
0	117,171	115,981	115,981	16,410	0	16,410	99
0	153,093	147,605	154,806	150,920	2,000	152,920	118
0	273,484	265,954	265,954	279,600	215	279,815	120
136,000	77,752	76,487	76,487	59,210	0	59,210	128
94,000	80,976	87,391	88,471	35,340	0	35,340	129
15,000	63,937	70,330	70,330	40,270	0	40,270	132
0	47,534	48,639	48,639	36,820	570	37,390	133
0	78,052	57,038	57,038	39,220	0	39,220	135
0	25,333	22,650	22,650	13,170	0	13,170	137
250,000	302,700	321,115	321,115	700	0	700	138
25,000	25,280	25,912	25,912	17,130	0	17,130	139
0	41,167	41,181	41,181	4,830	0	4,830	141
30,000	41,481	41,250	41,250	130	0	130	144
0	20,300	21,780	21,780	20,990	0	20,990	150
0	4,200	4,389	4,389	0	0	0	153
0	7,803	8,582	8,582	0	0	0	164
0	9,998	11,586	11,586	2,850	0	2,850	155
0	4,924	5,912	6,248	500	0	500	157
0	30,464	28,476	28,476	6,230	0	6,230	159
0	6,174	7,274	7,203	6,240	0	6,240	162
\$7,635,901	\$8,167,007	\$8,128,533	\$8,711,120	\$6,039,580	\$81,179	\$6,120,759	

original contractors defaulted

0	\$1,033,038	\$1,014,672	\$1,239,045	\$1,139,680	0	\$1,139,680	42A
0	790,488	759,159	759,159	751,490	\$1,500	752,990	70A
0	6,310	5,930	5,930	5,350	0	5,350	91A
0	52,717	67,053	67,053	3,230	0	3,230	122A
0	30,753	39,634	39,634	420	0	420	131A
0	\$1,913,306	\$1,886,448	\$2,110,821	\$1,900,170	\$1,500	\$1,901,670	

without liability to bondsmen on original contract

0	\$90,811	\$120,459	\$133,095	\$162,540	0	\$162,540	1A
0	152,200	169,760	169,760	9,890	\$1,460	11,850	19A
\$518,670	415,700	394,929	384,929	231,970	110	232,080	21A
621,017	651,703	630,568	627,568	142,250	0	142,250	23A
245,824	162,005	185,106	318,060	159,380	0	159,380	29A
86,000	122,013	128,182	128,182	79,610	0	79,610	30A
48,000	57,050	52,486	52,486	36,140	0	36,140	44A
0	333,942	196,134	196,134	167,750	890	168,649	46A
309,173	314,661	277,348	277,348	144,190	125	144,315	46B
945,870	1,038,469	726,034	726,034	198,720	0	198,720	47A
556,648	567,746	498,103	500,803	262,620	6,823	269,443	63A
432,045	432,045	321,680	458,266	318,140	344	318,484	73A
\$3,763,247	\$4,338,345	\$3,680,779	\$3,973,055	\$1,898,100	\$9,761	\$1,907,861	

CANAL, CHAPTER 391, LAWS OF 1909

original terms

0	\$29,019	\$25,831	\$26,842	\$24,140	0	\$24,140	A1
\$90,000	126,263	119,913	142,579	120,160	0	120,160	F
60,000	71,489	59,928	59,928	53,010	\$2,005	55,015	L
155,124	176,087	188,031	191,436	165,100	0	165,100	M
0	76,412	82,850	82,850	0	0	0	P
\$305,124	\$479,250	\$476,553	\$503,635	\$362,410	\$2,005	\$364,415	

TABLE II — CONTRACTS

Contract No.	CANAL	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed
IMPROVEMENT OF ERIE, OSWEGO AND CHAMPLAIN						
(A) Contracts completed un						
3	Champlain	2	Sundstrum & Stratton	4/ 4/05	4/15/07	12/ 1/08
4	Erie	5	Empire Engineering Corporation	4/18/05	11/15/07	12/31/09
4B	Erie	5	E. J. Doyle & Co.	12/ 1/10	3/ 1/11	3/ 1/11
6	Erie	9	F. A. Maselli	5/ 3/05	5/ 1/05	9/15/11
7	Erie, Champlain	1-5-7-9, 2	The Groton Bridge Co.	8/10/06	7/ 1/07	7/ 1/07
9	Erie	10	Thomas Crimmins Contracting Co.	3/18/08	5/ 1/10	6/ 1/11
10C	Oswego	1	Fulton Engineering Company, Inc.	11/18/14	9/18/15	9/18/15
11	Erie	1	Fort Orange Construction Co.	5/21/08	10/ 1/09	12/ 1/10
12	Erie	6-7	James Stewart & Co.	9/23/07	11/ 1/11	6/30/15
13	Erie	4 & 6	Penn Bridge Co.	11/ 7/08	4/ 1/09	4/ 1/10
14	Erie	1-2-3	Acme Engineering & Contracting Co.	9/10/07	4/ 1/12	4/ 1/12
14A	Erie	1-2	John Henkes	10/26/12	5/15/13	1/ 1/14
14B	Erie	1-2	Brown & Lowe Company	10/29/14	5/ 5/15	5/ 5/15
14R	Erie	1-2	Thomas F. Riley	11/28/11	1/ 1/12	1/ 1/12
15	Champlain	3	Atlantic, Gulf & Pacific Co.	8/ 9/06	3/ 1/10	4/15/12
16	Erie, Champlain	1, 2-3	The United Construction Co.	12/20/06	1/ 1/09	1/ 1/09
20B	Erie	3	S. Pearson & Son, Inc.	8/ 2/09	12/31/13	12/31/13
20C	Erie	3	American Pipe & Construction Co.	8/18/09	12/31/13	12/31/13
22	Erie	6-7	M. Fitzgerald	9/24/10	4/ 1/11	1/15/15
22A	Erie	7	Lupfer & Remick	8/ 8/12	12/ 1/12	11/ 1/13
24	Champlain	2	Kingsbury Construction Co.	11/ 1/11	4/30/12	1/ 1/14
25	Champlain	3	Atlantic, Gulf & Pacific Co.	11/19/08	3/ 1/11	10/ 1/12
26	Champlain	2	The Lake Erie Dredging Co.	4/ 6/03	12/ 1/09	6/ 1/10
31	Erie	4	Casey & Murray	9/ 2/08	8/12/12	2/ 1/13
32	Champlain	2-3	Penn Bridge Co.	4/19/09	1/ 1/10	1/ 1/10
33	Erie, Champlain, Oswego	1, 3, 1	Penn Bridge Co.	1/ 7/10	1/ 1/11	1/ 1/11
34	Erie	1	M. Fitzgerald	8/ 8/06	1/ 1/07	5/81/07
35	Oswego	1	Gilmour-Horton-Allen Co.	9/16/07	8/15/11	8/15/11
36	Erie	2-3	J. D. Miller	5/25/10	12/31/10	3/31/12
37	Oswego	1	Henry P. Burgard	12/ 9/10	5/ 1/14	5/ 1/14
37R	Oswego	1	Salladin & Henrick	11/29/12	7/ 1/13	7/ 1/13
38	Erie	9	Henry Toth & Son	1/11/06	5/ 1/09	5/ 1/09
39	Oswego	1	James Stewart & Co., Inc.	4/15/10	12/31/12	12/31/15
41	Erie	9	Butler Bros. Construction Co.	12/ 5/05	12/31/10	12/31/10
45	Erie	6	Scott Bros.	5/ 6/08	5/20/11	5/20/11
49	Erie	8	American Pipe & Construction Co.	2/21/10	5/ 1/12	5/ 1/14
50	Erie	5	Buffalo Dredging Co.	9/23/10	10/ 1/13	12/31/14
53	Oswego	1	Scott Bros.	8/16/09	12/31/11	12/31/11
54	Champlain	2	The Hunkin-Conkey Construction Co.	12/13/09	2/15/12	10/ 1/12
55	Erie	5	Arthur McMullen	10/19/05	10/15/11	6/ 1/12
55R	Erie	5	Joseph Kalk & Alfred S. Brown	11/ 3/11	1/ 1/12	6/ 1/12
56	Champlain	2	Flood & Van Wirt Co.	9/26/12	9/26/14	9/26/14
57	Erie	6	New York State Dredging Corporation	8/ 6/12	8/15/13	7/31/14
61	Erie	9	Cleveland & Sons Co.	10/13/05	5/15/12	7/15/13
62	Erie	10	I. M. Ludington's Sons, Inc.	8/11/10	5/ 1/13	12/31/13
64	Erie	10	Empire Engineering Corporation	8/ 6/08	1/31/12	1/31/12
65	Erie	10	Maryland Dredging & Contracting Co.	3/26/13	12/31/14	6/ 1/15
67	Erie	10	Larkin & Sangster	9/ 3/10	5/ 1/13	1/ 1/14
68	Champlain	1	Shanley-Morrissey, Inc.	11/23/05	4/15/12	4/15/12
69	Champlain	1	I. A. Hodge & Co., Inc.	12/11/09	12/31/11	3/ 1/13
75	Erie	9-10	United Construction Co.	3/ 1/10	1/ 1/11	4/15/12
76	Erie	8	The T. A. Gillespie Co.	12/23/10	12/23/13	12/23/13
77	Erie	8	The T. A. Gillespie Co.	12/23/10	5/ 1/13	12/23/13
78	Oswego	1	Cunningham-Woodard Co.	4/18/10	8/20/10	8/ 1/11
79	Oswego	1	Lupfer & Remick	9/23/10	8/ 1/11	8/ 1/11
80	Oswego	1	Walter Bradley	1/16/11	2/ 1/12	7/ 1/12
82	Erie	9	Groton Bridge Co.	12/ 7/10	11/ 1/11	4/15/14
85	Oswego	1	Lupfer & Remick	8/ 5/11	1/ 1/12	4/ 1/12
86	Erie	3	Lathrop, Shea & Henwood Co.	9/23/11	12/31/11	12/31/11
87	Erie	4	The P. B. McCaghey Co.	2/17/13	8/ 1/13	11/ 1/13
88	Champlain	1	Lathrop, Shea & Henwood Co.	11/ 4/11	6/ 1/12	12/20/12
89	Erie	8	Oswego Bridge Co.	5/28/12	4/ 1/13	4/ 1/13
90	Erie, Champlain, Oswego	6, 3, 1	D'Oliver Engineering Co.	4/12/10	12/ 1/11	12/ 1/11
90A	Oswego	1	Lupfer & Remick	8/ 8/12	5/ 1/13	10/ 1/13
100	Erie, Oswego	6, 1	W. J. Burns Company	9/12/13	10/ 1/14	5/ 1/15
101	Erie	6	Barrally & Ingersoll	8/ 8/12	12/15/12	9/ 1/13

COMPLETED TO JULY 1, 1917

1903 estimate as amended in 1915	Engineer's estimate	Original amount of contract	Amount of contract revised by alterations	Amount of final account	Amount of extra work	Total amount of work	Deferred work	Contract No.
CANALS, CHAPTER 147, LAWS OF 1903								
der original terms								
\$672,200	\$760,576	\$670,497	\$657,273	\$633,290	\$54,839	\$688,129		3
792,200	812,560	726,815	726,780	720,073	12,584	732,657		4
	1,353	1,385	1,351	1,332		1,332		4B
1,418,164	1,381,662	1,005,982	1,026,550	1,033,864	766	1,034,630		6
99,941	102,123	97,635	101,930	98,929	3,244	102,173		7
886,520	724,014	755,995	803,297	655,461	3,594	659,055		9
	56,738	38,490	38,656	39,904		39,904		10C
1,834,308	1,671,385	1,359,475	1,333,199	1,218,233	3,039	1,221,322		11
2,832,772	3,082,590	3,391,716	3,499,401	3,102,437	3,344	3,105,781		12
36,678	29,775	23,674	24,331	23,412		23,412		13
2,926,368	2,875,570	2,935,763	2,960,571	2,602,849	73,193	2,676,042		14
	4,765	4,315	4,046	4,010		4,010		14A
	79,955	71,021	88,444	88,169		88,169		14B
	533	724	629	629		629		14R
1,753,446	1,380,760	1,509,060	1,481,692	1,378,956	9,215	1,388,171		15
80,234	70,719	63,473	92,956	89,394	3,037	92,431		16
1,110,000	848,540	933,194	1,032,210	1,014,603	3,756	1,018,359		20B
747,000	570,600	585,720	607,035	658,036	3,829	661,855		20C
130,374	107,126	110,268	127,937	116,882	5,780	122,662		22
	24,916	27,099	27,099	26,984	886	27,870		22A
30,300	46,692	44,368	44,368	43,545	296	43,841		24
1,814,136	1,849,831	1,754,236	1,707,192	1,542,271	4,922	1,547,193		25
37,500	60,225	59,795	40,057	35,443		35,443		26
897,693	813,800	829,770	831,302	751,342	2,063	753,405		31
57,976	59,820	46,797	46,797	44,375		44,375		32
82,786	183,619	199,640	175,537	165,183	5,639	170,822		33
45,518	22,604	20,612	22,449	22,256	59	22,317		34
649,575	752,760	739,281	723,632	672,349	3,752	676,101		35
	72,000	44,800	46,800	46,800	410	47,210		36
2,032,493	1,992,220	2,323,995	2,496,063	2,606,789	2,891	2,609,680		37
	5,333	4,891	4,891	3,650	23	3,673		37R
19,764	20,131	17,157	16,870	16,287	348	16,635		38
335,713	972,900	1,048,674	1,032,561	953,695	16,108	969,803		39
381,648	383,190	281,330	273,238	241,644	97	241,741		41
534,098	425,124	467,514	472,802	418,652	867	419,519		45
776,730	756,679	750,279	744,343	686,608	110,936	797,544		49
1,016,328	1,076,000	963,415	998,058	987,699	7,974	995,673		50
229,345	200,500	166,735	167,585	164,576	1,113	165,689		53
473,500	232,908	250,590	251,370	223,159	731	223,893		54
711,083	1,014,525	903,347	945,840	882,773	2,038	884,811		55
	8,190	7,410	7,561	7,526	101	7,627		55R
331,350	317,638	319,956	362,309	326,283	7,259	333,542		56
111,071	85,625	93,506	93,506	93,315		93,315		57
1,225,851	1,000,219	1,047,994	1,180,853	1,048,283	363	1,018,666		61
2,784,802	2,151,470	2,347,836	2,662,645	2,831,924	22,424	2,854,348		62
1,849,019	1,207,930	1,290,492	1,349,925	1,198,389	1,591	1,199,980		64
650,482	1,131,523	1,000,098	1,020,486	1,109,647	1,271	1,110,918		65
1,202,794	1,290,880	1,149,401	1,161,543	1,027,137	21,635	1,048,772		67
1,326,779	1,175,624	1,018,323	1,024,282	946,168	1,645	947,813		68
256,366	270,675	240,061	238,302	231,504		231,504		69
107,100	39,525	42,917	42,917	41,028	2,814	43,842		75
971,617	1,504,776	1,494,057	1,491,880	1,378,760	22,350	1,401,110		76
1,759,216	1,790,672	1,652,148	1,716,891	1,641,965	49,501	1,691,466		77
	55,154	47,721	49,028	50,038	51	50,113		78
16,410	39,735	37,480	37,480	33,980	681	34,661		79
51,310	134,340	117,391	117,391	110,886	1,148	112,034		80
18,954	27,235	28,841	28,841	28,286	422	28,708		82
	12,783	13,238	13,151	12,098	241	12,339		85
30,890	41,871	43,440	43,440	38,468	696	39,161		86
54,570	10,900	11,202	11,202	11,400		11,400		87
38,928	23,553	25,656	35,784	30,844		30,844		88
77,723	65,116	59,616	59,748	56,146	59	56,205		89
6,830	180,690	178,197	180,239	171,633	7,100	178,733		90
58,924	64,840	64,020	62,884	62,884	253	63,137		90A
24,468	181,923	179,061	178,992	162,671	86	162,757		100
	40,639	40,639	40,984	39,150	1,505	40,655		101

## REPORT OF STATE ENGINEER

TABLE II — CONTRACTS COMPLETED

Contract No.	CANAL	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed
IMPROVEMENTS OF ERIE, OSWEGO AND CHAMPLAIN						
(A) Contracts completed un						
102	Erie	7	Lupfer & Remick	2/20/13	7/ 1/13	10/ 1/13
103	Oswego	1	Barralty & Ingersoll	12/10/12	12/ 1/13	10/ 1/14
104	Oswego	1	R. B. Murdock	3/ 5/12	12/31/12	7/ 1/13
105	Erie	9-10	Skene & Richmond	4/19/12	5/ 1/13	8/31/13
106	Erie	9-10	The W. S. Cooper Company	5/13/14	5/ 1/15	5/ 1/15
107	Erie	4	Jackson L. Richmond	2/19/13	5/ 1/14	5/ 1/14
108	Erie	8	I. M. Ludington's Sons, Inc.	10/17/13	5/ 1/14	5/ 1/14
109	Erie	2	Larkin & Sangster	7/31/14	7/31/15	7/31/15
110	Erie	5	Chesley, Earl & Heimbach, Inc.	12/ 3/13	11/ 1/14	6/ 1/15
112	Erie	9-10	John Young	4/24/13	5/10/13	5/10/13
113	Erie	9-10	Wm. J. Dowdle	4/15/13	5/15/13	5/15/13
114	Erie	1	Charles A. Hager	10/ 7/13	5/ 1/14	5/ 1/14
119	Erie	2	Holler & Shepard	8/ 4/14	2/ 4/15	2/ 4/15
121	Erie	6	General Erecting Co.	7/ 8/14	4/ 8/15	4/ 8/15
123	Erie	5	Frank L. Cohen	5/11/14	5/11/15	5/11/15
125	Erie	2	Kaith O. Guthrie	8/31/14	1/31/15	5/31/15
126	Champlain	1	Horseheads Construction Co.	9/ 4/14	12/ 4/14	5/ 1/15
130	Erie	1	Great Lakes Dredge & Dock Co.	4/ 3/16	7/15/16	7/15/16
140	Champlain	1	Holler & Shepard	11/ 1/16	3/ 1/17	3/ 1/17
145	Erie	2	Horseheads Construction Co.	1/ 4/17	5/ 1/17	5/ 1/17
158	Erie, Oswego		James McKinney & Son	3/22/17	5/ 1/17	5/ 1/17
Totals						
(B) Contracts completed except certain work deferred						
19	Erie	11	Great Lakes Construction Co.	11/26/09	12/31/10	12/31/13
40	Erie	10	The United Engineering & Contracting Co.	11/27/03	12/ 1/11	12/31/13
48	Erie	8	The Sherman-Stalter Co.	12/29/10	1/ 1/14	1/ 1/14
60	Erie	9	Empire Engineering Corporation	8/ 7/03	1/31/12	1/31/13
66	Erie	10	Empire Engineering Corporation	9/22/03	10/15/11	10/15/11
92	Erie, Champlain	1-4.	MacArthur Bros. Co. & Lord Electric Co.	2/17/13	5/ 1/15	5/ 1/15
		1-2				
93	Erie, Oswego	5-7, 1	MacArthur Bros. Co. & Lord Electric Co.	8/12/13	5/ 1/15	5/ 1/15
94	Erie	8-10	MacArthur Bros. Co. & Lord Electric Co.	2/17/13	11/ 1/14	2/ 1/15
Totals						
(C) Reliet contracts on which						
2	Erie	1	The Ferguson Contracting Co.	4/ 3/05	7/ 1/07	11/ 1/08
2E	Erie	1	Holler & Shepard	12/ 8/09	3/ 1/11	11/ 1/12
10	Oswego	1	McDermott Contracting Co.	6/ 7/06	7/ 1/09	9/ 1/11
10A	Oswego	1	The T. A. Gillespie Co.	12/14/11	9/ 1/12	1/ 1/14
10B	Oswego	1	Oswego Construction Co., Inc.	3/ 4/12	12/1/13	12/ 1/13
17	Erie	3	The Scofield Co.	12/29/06	1/ 1/10	1/ 1/10
17	Erie	3	Alexander Murdoch	3/ 3/08	10/ 1/11	10/ 1/11
71	Champlain	1	Shanley-Morrissey, Inc.	1/11/10	12/31/12	12/31/12
71A	Champlain	1	P. McGovern & Co.	1/16/13	5/15/15	12/ 1/15
72	Champlain	1	Shanley-Morrissey, Inc.	12/14/09	12/30/12	12/30/12
72A	Champlain	1	James Stewart & Co., Inc.	3/27/13	5/ 1/16	5/ 1/16
Totals						
(D) Reliet contracts canceled by the Canal Board						
5	Erie	7	Empire Engineering Corporation	4/18/05	11/15/07	11/15/07
5A	Erie	7	James Stewart & Co.	1/20/12	1/20/13	1/20/13
8	Erie	2	Pittsburgh-Eastern Co.	5/22/08	7/ 1/10	1/ 1/12
8A	Erie	2	The Foundation Co.	7/ 6/12	7/15/14	8/ 1/15
18	Erie	4	Kelley Bros. Contracting Co.	12/28/08	12/30/10	12/20/10
20A	Erie	4	Houston Barnard	8/20/09	12/31/13	12/31/13

a Figures refer to part of work completed before contract was closed.

b Reliet, not included in the footings.

c Contract shortened; figures refer to part of line constructed, including the unfinished work which was put under contract No. 5A.

# BARGE CANAL

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TO JULY 1, 1917 — (Continued)

1903 estimate as amended in 1915	Engineer's estimate	Original amount of contract	Amount of contract revised by alterations	Amount of final account	Amount of extra work	Total amount of work	Deferred work	Contract No.
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## CANALS, CHAPTER 147, LAWS OF 1903 — (Continued)

der original terms — (Continued)

\$19,911	\$25,035	\$25,993	\$25,993	\$24,534	\$28	\$24,560		102
18,618	185,655	197,965	205,745	182,825	2,208	185,033		103
14,069	45,580	39,370	39,370	36,856		36,856		104
168,800	253,010	258,710	259,355	245,688		245,688		105
202,088	293,105	280,152	279,113	269,678	4,590	274,268		106
27,328	124,471	127,707	127,707	114,661	432	115,093		107
30,879	99,341	94,394	94,394	83,799	400	84,199		108
20,371	190,244	163,917	163,917	151,371		151,371		109
39,936	123,000	118,367	129,566	123,860	379	124,239		110
	130,500	120,350	120,350	120,519		120,519		112
	26,452	21,964	21,964	21,971		21,971		113
	36,327	35,504	35,504	36,858	50	36,908		114
	64,666	58,073	58,073	50,567		50,567		119
	9,590	9,670	9,670	9,051	59	9,110		121
	18,065	16,574	16,574	17,530		17,530		123
26,544	45,885	41,267	41,267	38,695	483	39,178		125
	8,314	6,904	6,904	5,947	154	6,101		126
	9,000	7,140	7,140	5,508		5,508		130
	5,454	4,559	4,559	4,856		4,856		140
	5,092	3,978	3,978	3,765		3,765		145
	3,853	3,127	3,127	3,127		3,127		158
\$38,960,450	\$40,095,164	\$39,418,021	\$40,545,007	\$38,258,651	\$493,453	\$38,752,104		

to await general completion of entire enterprise

\$597,449	\$1,038,245	\$1,000,497	\$358,468	\$785,236	\$39,797	\$825,083	\$32,933	19
812,388	2,516,743	2,166,298	2,237,256	2,112,403	823	2,113,231	14,826	40
1,181,817	1,626,811	1,701,671	1,611,691	1,472,931	10,068	1,482,999	67,575	48
1,395,526	1,267,201	1,349,084	1,484,803	1,317,919	28,342	1,346,261	6,513	60
1,138,063	751,039	750,685	852,805	777,761	5,399	783,160	1,589	66
326,701	1,244,940	1,178,976	1,203,134	1,199,076	10,318	1,209,394	340	92
110,305	393,701	379,693	380,757	364,305		364,305		75
124,777	461,300	433,381	431,703	436,865	2,924	439,789	2,710	94
\$5,687,216	\$9,300,080	\$8,960,285	\$9,060,616	\$8,466,551	\$97,671	\$8,564,222	\$126,561	

original Contractors defaulted

\$1,037,244	\$1,022,640	\$852,330	\$733,811	\$689,688	\$35,942	\$725,630		2
	6263,189	6261,663	307,023	279,184	6,951	286,135		2E
1,157,710	1,149,988	1,126,718	709,533	688,360	2,019	670,379		10
	6103,058	6106,733	174,514	166,172	2,411	168,583		10A
	6518,044	6491,293	800,213	526,003	7,803	533,811		10B
972,623	883,926	836,725	601,145	53,794		53,794		17
	6836,221	6804,516	812,286	751,352	2,917	754,269		17
911,000	1,502,100	1,561,119	862,750	821,960	4,345	826,305		71
	61,017,625	61,217,016	1,401,760	1,486,766	935	1,487,701		71A
1,496,599	1,439,733	1,192,753	649,836	618,900		618,900		72
	61,396,585	61,534,603	1,534,603	1,515,095		1,515,095		72A
\$5,575,176	\$5,993,387	\$5,568,650	\$7,747,474	\$7,577,277	\$63,325	\$7,640,602		

without liability to bondsmen on original contract

\$179,886	\$168,145	\$151,172	\$125,820	\$125,820		\$125,820		5
	6395,285	6317,597	326,903	319,351		319,351		5A
1,255,169	1,618,382	1,433,817	1,042,654	920,420	\$356	920,776		8
	6888,363	6799,399	977,663	957,703	9,907	967,610		8A
1,105,899	785,980	859,460	611,382	476,979	19,806	496,585		18
663,000	499,000	490,592	320,679	320,691	800	321,491		20A



TABLE II — CONTRACTS COMPLETED

Contract No.	CANAL	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed
IMPROVEMENTS OF ERIE, OSWEGO AND CHAMPLAIN						
(D) Relet contracts canceled by the Canal						
d18A	Erie.....	4	New York State Dredging Corporation.....	2/17/14	2/17/16	2/17/16
e115	Erie.....	2	Penn Bridge Co.....	10/28/14	6/28/15	6/28/15
23B	Erie.....	9	Michael E. Sweeney.....	11/ 4/14	11/15/14	11/15/14
27	Champlain.....	2	The Kinser Construction Co.....	11/23/09	12/30/09	12/30/09
f54	Champlain.....	2	The Hunkin-Conkey Construction Co.....	12/13/09	2/15/12	10/ 1/12
27A	Champlain.....	2	Holler & Shepard.....	12/ 1/10	5/ 1/12	5/ 1/14
27B	Champlain.....	2	John J. Farrell, Jr.....	5/23/16	8/23/16	8/23/16
g116	Erie.....	7	Walsh Construction Co.....	1/16/14	1/16/15	5/ 1/15
Totals.....						

a Figures refer to part of work completed before contract was closed.

b Relet, not included in the footings.

c Contract shortened; figures refer to part of line constructed, including the unfinished work which was put under contract No. 5A.

d Completes contracts Nos. 18 and 20A.

e Originally part of contract No. 8.

f Originally part of contract No. 27.

g Covers small portion of contract No. 46.

## IMPROVEMENT OF CAYUGA AND SENECA

## Contracts completed

A	Cayuga and Seneca.....	1	Scott Bros.....	12/30/10	5/ 1/13	1/ 1/14
B	Cayuga and Seneca.....	1	The Sherman-Stalter Co.....	12/29/10	12/ 1/14	12/ 1/14
C	Cayuga and Seneca.....	1	Larkin & Sangster.....	1/11/13	1/15/16	1/15/16
D	Cayuga and Seneca.....	1	The Sherman-Stalter Co.....	2/24/14	8/24/16	8/24/16
E	Cayuga and Seneca.....	1	Cleveland & Sons Co.....	1/ 7/13	1/ 7/15	7/31/15
G	Cayuga and Seneca.....	1	Lupfer & Remick.....	11/24/14	11/24/15	11/24/15
H	Cayuga and Seneca.....	1	New York State Dredging Corporation.....	12/22/11	1/ 1/13	12/31/13
I	Cayuga and Seneca.....	1	The Central Dredging Co.....	9/23/12	3/ 1/14	3/ 1/14
J	Cayuga and Seneca.....	1	Chesley, Earl & Heimbach, Inc.....	11/27/14	11/27/15	11/27/15
K	Cayuga and Seneca.....	1	The Phoenix Bridge Co.....	10/30/14	10/30/15	10/30/15
Total.....						

TABLE III — CONTRACTS

## IMPROVEMENT OF ERIE, OSWEGO AND CHAMPLAIN

Contract No.	Canal	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed	1903 estimate as amended in 1915
(A) Without liability to bondsmen							
1. Relet — completed to							
5	Erie.....	7	Empire Engineering Corporation.....	4/18/05	11/15/07	11/15/07	\$179,886
5A	Erie.....	7	James Stewart & Co.....	1/30/13	1/30/13	1/30/12	
a8	Erie.....	2	Pittsburg-Eastern Co.....	5/22/03	7/ 1/10	1/ 1/12	1,255,109
8A	Erie.....	2	The Foundation Co.....	7/ 6/13	7/15/14	8/ 1/15	
115	Erie.....	2	Penn Bridge Co.....	10/28/14	6/28/15	6/28/15	
118	Erie.....	4	Kelley Bros. Contracting Co.....	12/28/03	12/30/10	12/30/10	1,105,809
20A	Erie.....	4	Houston Barnard.....	8/30/03	12/31/13	12/31/13	653,000
d18A	Erie.....	4	New York State Dredging Corporation.....	2/17/14	2/17/16	2/ 7/16	
23	Erie.....	9	Millard & Lupton Co.....	8/18/09	2/ 1/13	2/ 1/13	
23B	Erie.....	9	Michael E. Sweeney.....	11/ 4/14	11/15/14	11/15/14	
27	Champlain.....	2	The Kinser Construction Co.....	11/23/03	12/30/09	12/30/09	1,177,034
27A	Champlain.....	2	Holler & Shepard.....	12/ 1/10	5/ 1/12	5/ 1/14	
b46	Erie.....	7	The Kinser Construction Co.....	11/23/03	6/ 1/12	12/ 1/13	
b116	Erie.....	7	Walsh Construction Co.....	1/16/14	1/16/15	5/ 1/15	
Totals.....							\$4,370,978

a Includes contract No. 115.

b Contract No. 116 covers small portion of contract No. 46.

c Unfinished portions of contract No. 23 have been relet as contracts Nos. 23A and 1 23B.

d Completes contracts Nos. 18 and 20A.

TO JULY 1, 1917 — (Concluded)

1903 estimate as amended in 1915	Engineer's estimate	Original amount of contract	Amount of contract revised by alterations	Amount of final account	Amount of extra work	Total amount of work	Deferred work	Contract No.
CANALS, CHAPTER 147, LAWS OF 1903 — (Concluded)								
Board without liability to bondsmen on original contract — (Continued)								
.....	\$51,591,536	\$51,654,757	\$1,698,784	\$1,668,069	\$10,092	\$1,684,161	.....	18A
.....	6127,470	6105,868	107,538	96,989	53	97,042	.....	e115
.....	55,800	55,262	5,262	4,736	.....	4,736	.....	23B
\$1,177,024	996,920	972,210	2409,146	378,650	14,885	393,535	.....	27
473,600	6232,908	6250,590	251,370	223,159	734	223,893	.....	754
.....	6409,455	6449,499	508,600	491,481	57,283	548,764	.....	27A
.....	9,725	6,845	6,845	6,043	.....	6,043	.....	27B
.....	674,145	672,185	72,185	76,672	612	77,284	.....	p116
\$4,844,478	\$3,980,152	\$3,914,096	\$6,464,820	\$6,066,763	\$120,328	\$6,187,091	.....	

## CANALS, CHAPTER 391, LAWS OF 1909

under original terms

\$451,270	\$393,133	\$357,627	\$376,233	\$350,974	\$1,871	\$352,845	.....	A
2,192,388	1,832,550	1,448,550	1,388,434	1,303,763	9,406	1,313,169	.....	B
767,382	1,140,872	1,187,047	1,195,407	1,101,720	69,909	1,171,629	.....	C
837,320	1,308,765	1,004,555	1,059,553	955,500	4,466	959,966	.....	D
572,550	319,666	347,216	353,660	315,980	1,666	317,646	.....	E
175,000	119,809	110,115	110,115	102,004	292	102,296	.....	G
.....	178,237	179,769	225,001	218,479	.....	218,479	.....	H
.....	304,330	215,639	203,441	186,886	484	187,350	.....	I
.....	52,940	47,648	47,648	45,122	.....	45,122	.....	J
80,000	71,218	63,214	63,214	60,480	.....	60,480	.....	K
\$5,075,910	\$5,721,520	\$4,961,380	\$5,022,706	\$4,640,908	\$88,074	\$4,728,982	.....	

## CANCELLED BY CANAL BOARD

CANALS, CHAPTER 147, LAWS OF 1903

SUSPENDED CONTRACTS			RELET CONTRACTS			Last monthly estimate	Extra work	Total work to July 1, 1917	Contract No.
Engineer's estimate	Original amount of contract	Amount of contract revised by altera- tions	Engineer's estimate	Original amount of contract	Amount of contract revised by altera- tions				
on original contracts									
July 1, 1917									
\$168,145	\$151,172	\$156,941				\$125,820	0	\$125,820	5
			\$395,285	\$317,597	\$326,902	319,351	0	319,351	5A
1,518,382	1,433,817	1,516,789				920,420	\$356	920,776	8
			858,363	793,399	977,653	967,703	9,907	967,610	28A
			127,470	105,868	107,538	96,989	53	97,042	115
785,980	859,460	811,332				476,979	19,606	496,585	18
499,000	490,592	320,679				320,691	800	321,491	20A
			1,691,686	1,654,757	1,693,784	1,668,069	16,092	1,684,161	218A
									223
			5,800	5,262	5,262	4,736	0	4,736	223B
766,012	721,620	723,269				378,650	14,885	393,535	27
			409,455	449,499	508,600	491,481	57,283	548,764	27A
									27B
			74,145	72,185	72,185	76,672	612	77,284	27C
\$3,737,519	\$3,656,661	\$3,329,060	\$3,492,084	\$3,404,567	\$3,696,924	\$5,837,561	\$119,594	\$5,957,155	27D



TABLE III—CONTRACTS CANCELLED  
IMPROVEMENT OF ERIE, OSWEGO AND CHAMPLAIN

Contract No.	Canal	Section	Contractor	Date of contract	Original date to be completed	Revised date to be completed	1903 estimate as amended in 1915
<i>S. Relat — under way</i>							
1	Champlain..	2	Empire Engineering Corporation.....	4/18/05	10/1/03	10/1/10	\$632,101
1A	Champlain..	2	Holler & Shepard.....	8/31/14	5/31/15	5/31/15	
21	Erie.....	9	Lane Bros. Co.....	4/7/10	5/1/13	5/1/13	1,393,977
21A	Erie.....	9	Walsh Construction Co.....	2/16/16	8/16/17	8/16/17	518,670
c23	Erie.....	9	Millard & Lupton Co.....	8/18/03	2/1/13	2/1/13	1,693,035
c23A	Erie.....	9	H. S. Kerbaugh, Inc.....	5/20/16	1/20/18	1/20/18	621,017
29	Erie.....	4	Maryland Dredging and Contracting Co....	4/3/09	12/31/11	12/31/12	745,377
29A	Erie.....	4	Eastover Construction Co., Inc.....	3/27/16	9/27/17	9/27/17	245,824
30	Erie.....	4	Aeme Engineering & Contracting Co.....	7/16/02	12/31/12	12/31/12	2,288,631
30A	Erie.....	4	Mohawk Dredge & Dock Co., Inc.....	11/24/16	5/1/17	5/1/17	86,000
44	Erie.....	5	Scott Brothers.....	1/8/10	7/1/13	9/1/15	1,640,352
44A	Erie.....	5	Scott Brothers.....	10/10/16	5/1/17	5/1/17	48,000
b46	Erie.....	7	The Kinsar Construction Co.....	11/23/03	6/1/12	12/1/13	1,470,906
46B	Erie.....	7	James Stewart & Co., Inc.....	9/2/14	3/2/16	12/31/16	
46B	Erie.....	7	Scott Brothers.....	2/25/16	8/25/17	8/25/17	309,173
47	Erie.....	8	The Crowell-Sherman-Stalter Co.....	11/30/03	5/20/12	5/20/12	1,829,174
47A	Erie.....	8	Central Dredging Co.....	3/22/16	11/22/17	11/22/17	945,870
63	Erie.....	9	H. S. Kerbaugh, Inc.....	6/3/10	12/31/12	12/31/13	2,353,463
63A	Erie.....	9	State Highway Construction Co.....	5/24/23	2/23/18	2/23/18	556,648
73	Champlain..	1	K. M. Graves.....	5/26/10	5/15/13	5/15/13	231,451
73A	Champlain..	1	Great Lakes Dredge & Dock Co.....	1/15/16	7/15/17	7/15/17	432,045
Totals.....							\$18,041,812
b Contract No. 116 covers small portion of contract No. 46.							
c Unfinished portions of contract No. 23 have been relet as contracts Nos. 23A and 23B.							
(B) On which bondsmen on original contracts							
<i>1. Relat — completed to</i>							
2	Erie.....	1	The Ferguson Contracting Co.....	4/3/03	7/1/07	11/1/08	\$1,037,244
2E	Erie.....	1	Holler & Shepard.....	12/8/03	3/1/11	11/1/12	
10	Oswego.....	1	McDermott Contracting Co.....	6/7/03	7/1/09	9/1/11	1,157,710
10A	Oswego.....	1	The T. A. Gillespie Co.....	12/14/11	9/1/12	1/1/14	
10B	Oswego.....	1	Oswego Construction Co., Inc.....	3/4/12	12/1/13	12/1/13	
17	Erie.....	3	The Soofield Co.....	12/23/03	1/1/10	1/1/10	972,623
17	Erie.....	3	Alexander Murdoch.....	3/3/03	10/1/10	10/1/11	
71	Champlain..	1	Shanley-Morrissey, Inc.....	1/11/10	12/31/12	12/31/12	911,000
71A	Champlain..	1	P. McGovern & Co.....	1/16/13	5/15/15	12/1/15	
72	Champlain..	1	Shanley-Morrissey, Inc.....	12/14/09	12/30/12	12/30/12	1,496,599
72A	Champlain..	1	James Stewart & Co., Inc.....	3/27/13	5/1/16	5/1/16	
Totals.....							\$5,575,176
<i>2. Relat — under way,</i>							
42	Erie.....	5	Shanley-Morrissey, Inc.....	7/9/09	2/1/12	2/1/12	\$1,609,937
42A	Erie.....	5	Grant Smith & Co. & Locher.....	2/24/13	1/1/15	1/1/15	
70	Champlain..	1	Shanley-Morrissey, Inc.....	1/11/10	12/31/12	12/31/12	282,500
70A	Champlain..	1	Central Dredging Co.....	10/22/12	12/1/15	12/1/15	
122	Erie.....	4	Thomas Leonard.....	2/23/16	2/23/17	2/23/17	69,978
122A	Erie.....	4	Chealey, Earl & Heimbach, Inc.....	3/8/17	3/8/18	3/8/18	
131	Champlain..	1	Spaulding Construction Co.....	3/28/16	3/28/17	3/28/17	36,000
131A	Champlain..	1	M. Fitzgerald.....	3/5/17	3/5/18	3/5/18	
Totals.....							\$1,998,415

ED BY CANAL BOARD—(Continued)

CANALS, CHAPTER 147, LAWS OF 1903—(Continued)

SUSPENDED CONTRACTS			RELET CONTRACTS			Last monthly estimate	Extra work	Total work to July 1, 1917	Con- tract No.
Engineer's estimate	Original amount of contract	Amount of contract revised by altera- tions	Engineer's estimate	Original amount of contract	Amount of contract revised by altera- tions				
<i>July 1, 1917</i>									
\$619,846	\$605,008	\$471,735				\$472,041	\$7,834	\$479,875	1
			\$90,811	\$120,459	\$133,095	162,540	0	162,540	1A
1,475,900	1,323,150	983,625				949,000	0	949,000	21
			415,700	384,929	384,929	231,970	110	232,080	21A
2,186,600	1,887,036	1,243,865				1,205,125	2,601	1,207,726	23
			651,703	630,568	627,568	142,250	0	142,250	23A
812,350	683,714	498,997				498,120	8,382	506,502	29
			162,005	185,106	318,660	159,380	0	159,380	29A
2,650,500	2,591,666	2,751,261				2,911,230	1,957	2,913,187	30
			122,013	128,182	128,182	79,610	0	79,610	30A
1,926,093	1,748,679	1,703,598				1,625,205	4,794	1,629,999	44
			57,050	52,486	52,486	36,140	0	36,140	44A
1,367,583	1,212,833	842,721				842,689	0	842,689	46
			333,942	196,134	196,134	157,750	890	158,640	46A
			314,661	277,343	277,343	144,190	125	144,315	46B
1,434,148	1,262,638	829,194				830,850	2,592	833,442	47
			1,038,469	726,034	726,034	193,720	0	193,720	47A
2,184,083	1,990,043	2,577,299				2,572,353	420,856	2,993,209	63
			567,746	488,103	500,603	262,520	6,823	269,343	62
778,990	767,467	518,829				517,223	0	517,223	73
			432,045	321,680	458,266	318,140	344	318,484	73A
\$15,416,093	\$14,072,231	\$12,426,124	\$4,186,145	\$3,511,029	\$3,803,305	\$14,312,046	\$457,317	\$14,769,363	

are liable owing to failure of original contractors

<i>July 1, 1917</i>									
\$1,022,640	\$852,330	\$990,076				\$689,683	\$35,942	\$725,630	2
1,149,988	1,126,718	1,187,169	\$263,189	\$261,663	\$307,023	279,184	6,951	286,135	2E
						668,360	2,019	670,379	10
			103,058	109,733	174,514	166,172	2,411	168,583	10A
			515,044	491,295	500,213	526,206	7,805	533,811	10B
893,926	835,725	842,418				53,794	0	53,794	17
			835,221	804,516	812,285	751,352	2,917	754,269	17A
1,502,100	1,561,119	1,718,970				821,960	4,345	826,305	71
			1,017,625	1,217,016	1,401,760	1,486,766	935	1,487,701	71A
1,439,733	1,192,758	1,221,112				618,900	0	618,900	72
			1,395,585	1,534,603	1,534,603	1,515,095	0	1,515,095	72A
\$5,098,387	\$5,568,650	\$5,959,745	\$4,131,722	\$4,415,830	\$4,730,399	\$7,577,277	\$63,325	\$7,640,602	

<i>July 1, 1917</i>									
\$1,312,814	\$1,163,625	\$1,220,739				\$478,670	0	\$478,670	42
740,300	779,636	779,636	\$1,033,038	\$1,014,672	\$1,239,045	1,139,680	0	1,139,680	42A
						236,240	0	236,240	70
56,340	56,615	56,615	790,488	759,159	759,159	751,490	\$1,500	752,990	70A
						6,090	0	6,090	122
31,248	29,734	29,734	52,717	67,053	67,053	3,230	0	3,230	122A
			30,753	39,634	39,634	850	0	850	131
						420	0	420	131A
\$2,152,702	\$2,029,610	\$2,066,724	\$1,906,906	\$1,880,518	\$2,104,891	\$2,616,670	\$1,500	\$2,618,170	

### BARGE CANAL TERMINALS

During the year work has steadily progressed in completing the terminal dockwalls and grading the sites at the various locations. On the majority of the upstate terminals, temporary warehouses have been constructed, with the thought of accomplishing a double purpose, namely, to provide temporary facilities for handling freight and postpone the permanent construction until conditions in the labor and material markets are more favorable, and by the use of these temporary facilities to observe actually the results obtained at each terminal, since such information will be invaluable in planning the permanent work.

In Greater New York the construction of Barge canal terminals is in progress at the following locations: West 53d street, North river; Piers 5 and 6, East river; Greenpoint; E. 138th street, Harlem river; and Gowanus bay. At this latter location there has been some discussion as to the possibility of constructing a grain elevator, but the State has never definitely committed itself to such construction. This site at Gowanus bay is admirably located for elevator purposes. Knowing that the Federal Government would be called upon to make provision for sending oversea millions of bushels of grain to supply both our expeditionary forces and our Allies, the availability of this site for an elevator was brought to the Government's attention, and the State offered so to construct the pier now in process of building that, without interfering with its usefulness for general cargo-handling, it could also serve as a part of a 10,000,000-bushel elevator, which might easily be constructed on this site. No definite action has yet been taken by the Federal Government as to the construction of such an elevator.

During the past year considerable progress has been made in arriving at a settlement with the owners from whom property was appropriated in Greater New York for terminal purposes. Due, however, to the constant fluctuation in prices governing construction, it is not yet possible to arrive at any close estimate of the probable cost of development at the various sites now owned by the State. There is constantly being brought to the attention of the State Engineer sites which might be acquired and on which Barge canal terminals could be constructed. In the majority of



BARGE CANAL TERMINAL AT PIERS 5 AND 6, E. R., NEW YORK

Pier 6, East river, being repaired and widened. Pier 5, seen at the right, has also been acquired by the State. This is the most important Barge canal terminal in New York city, being close to the downtown business district.



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cases the locations suggested are susceptible of development and would be of benefit to the locality. The State is now the owner of water-front property in Greater New York which will have been acquired as the result of the expenditure of a large sum of money. To ever realize on the investment the State must develop this property, and such is the present policy of the State in the matter. Until the work has further advanced and a closer estimate can be made of the ultimate cost of such development, the State is hardly in a position to obligate itself to construct additional terminals for which the sites have not been acquired. In arriving at this conclusion the fact has never been lost sight of that no provision for constructing terminals has been made for many sections of Greater New York where such construction is justified.

I am still of the opinion that the terminals are vital to the success of the canals and I am bending every effort so to plan and construct them that on their completion they will efficiently and economically serve the needs of traffic and the requirements of shippers. It is certain that when they do demonstrate their value, further appropriations must be made, not only to increase the equipment on those already provided, but to build additional ones.

#### WAR CONDITIONS AS AFFECTING CONTRACTORS

The construction of the Barge canal had been so far progressed when war was declared on April 6, 1917, that substantially all the heavy pieces of work had either been completed on that date or were under contract. Several construction contracts, involving altogether approximately six million dollars' worth of work, which had been let by the State prior to April 6 and bore dates for completion that carried them past April 6, were not finished for some months after that date and some of them are still in force. It is needless to call your attention to the extraordinary increase in prices of labor and materials which has taken place since April 6, or to the many necessary governmental regulations which have tended to interfere with contractors' operations. The difficulty and cost of progressing contract work since the declaration of war have been increased to an almost unbelievable extent. In spite of these discouragements and in the face of certain heavy financial losses, the majority of the contractors holding those Barge canal

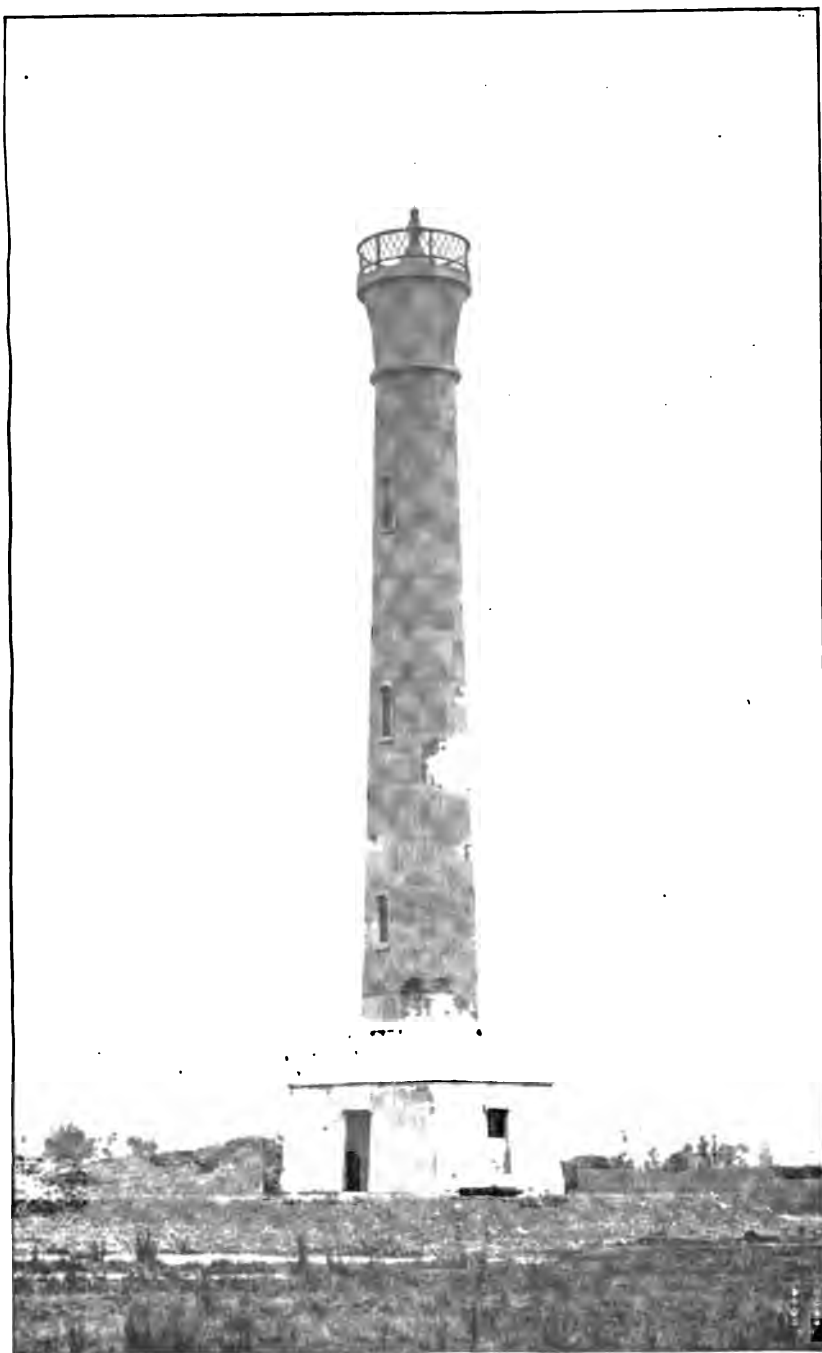
contracts, the completion of which is vital to the opening of the canal in 1918, have bravely continued their work. In view of the fact that in bidding upon these contracts the contractors could not have foreseen the remarkable conditions that have since arisen, conditions which have been brought about by a situation entirely and absolutely beyond their control, and that the law and the State's interests demand that they fully complete their work and fulfill their contractual obligations, I call your attention to the facts with the hope that some just method may be found which will alleviate, at least partially, some of the financial burdens which these contractors have been courageously carrying in their effort to complete the canals.

#### CANAL MAINTENANCE

In my last report, submitted to your honorable body under date of January 10, 1917, it was pointed out that considerable sums must be expended each year to maintain the required depth of twelve feet in the channel of the Barge canal and that the cost of such work should be paid from an appropriation made by the Legislature for that specific purpose and not from the Barge canal fund, which is purely a construction fund. It was never intended that canal monies provided under the referendum measures should be used for maintenance purposes and I trust sufficient funds will be made available for the use of the Superintendent of Public Works to permit him properly to maintain the system. Aside from the legal question involved in the possible expenditure of funds for purposes other than those for which the monies were made available, engineers cannot be held responsible for preliminary estimates, if contingent items are introduced which were not considered as a part of the cost when these estimates were made.

#### WORK TO BE UNDERTAKEN BY THE FEDERAL GOVERNMENT IN MAKING CONNECTION WITH FEDERAL WATERS AT THE TERMINI OF THE CANAL

The Barge canal has four termini where it joins Federal waters, namely, at Oswego, Tonawanda, Waterford and Whitehall. The Government work has not been completed at all of these locations to such an extent as to give full and complete use to the canal



LIGHTHOUSE AT BREWERTON

Three lighthouses, all similar in design—one at Brewerton, one at Sylvan Beach and one on Frenchman's island—mark the two main sailing courses across the length of Oneida lake.



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system of the state. For the present at least the Federal Government will undoubtedly feel that its expenditures must be confined as far as possible to war necessities. The unrestricted use of the Barge canal will materially assist in relieving freight congestion and in view of the small amount involved in affording proper connections with Federal waters, compared with the millions spent by the State of New York in constructing its inland waterway system, it seems only right and proper that the Government should see to it that such work is performed, and I can only renew the recommendations made in my last two annual reports, "that your honorable body by proper legislative action communicate with the Federal authorities, urging this necessity."

#### USE OF SURPLUS WATERS

We are today having called to our attention more forcibly than ever before the absolute necessity of conserving all forms of energy. It therefore behooves the State to give the question of the use of its surplus waters the most careful consideration and reduce to a minimum the wastage of power. State officials and others who have given the subject some thought agree that a strong, definite policy should be adopted in treating the broad question of power development and flood control in the rivers and streams of the state. I am strongly of the opinion that the State should not embark in any proposition of this nature or become a party to any undertaking until the many varied and complex problems which are involved have been approached from all angles and solved in such a way as to insure the greatest ultimate benefit to both the State at large and its citizens.

There is, however, a situation which confronts the State today that, in my opinion, merits immediate consideration at your hands: The construction of the Barge canal has incidentally made available for development power aggregating several thousand horse-power, and situated as it is on the line of the canal it is available for use in the thriving communities that border the State's waterways. Under present laws the State is prohibited from disposing of any surplus waters thus created. I believe that legislation could be so drawn as to permit the leasing of these waters under long term leases which could safeguard canal interests. By taking such action the State would be assured of addi-

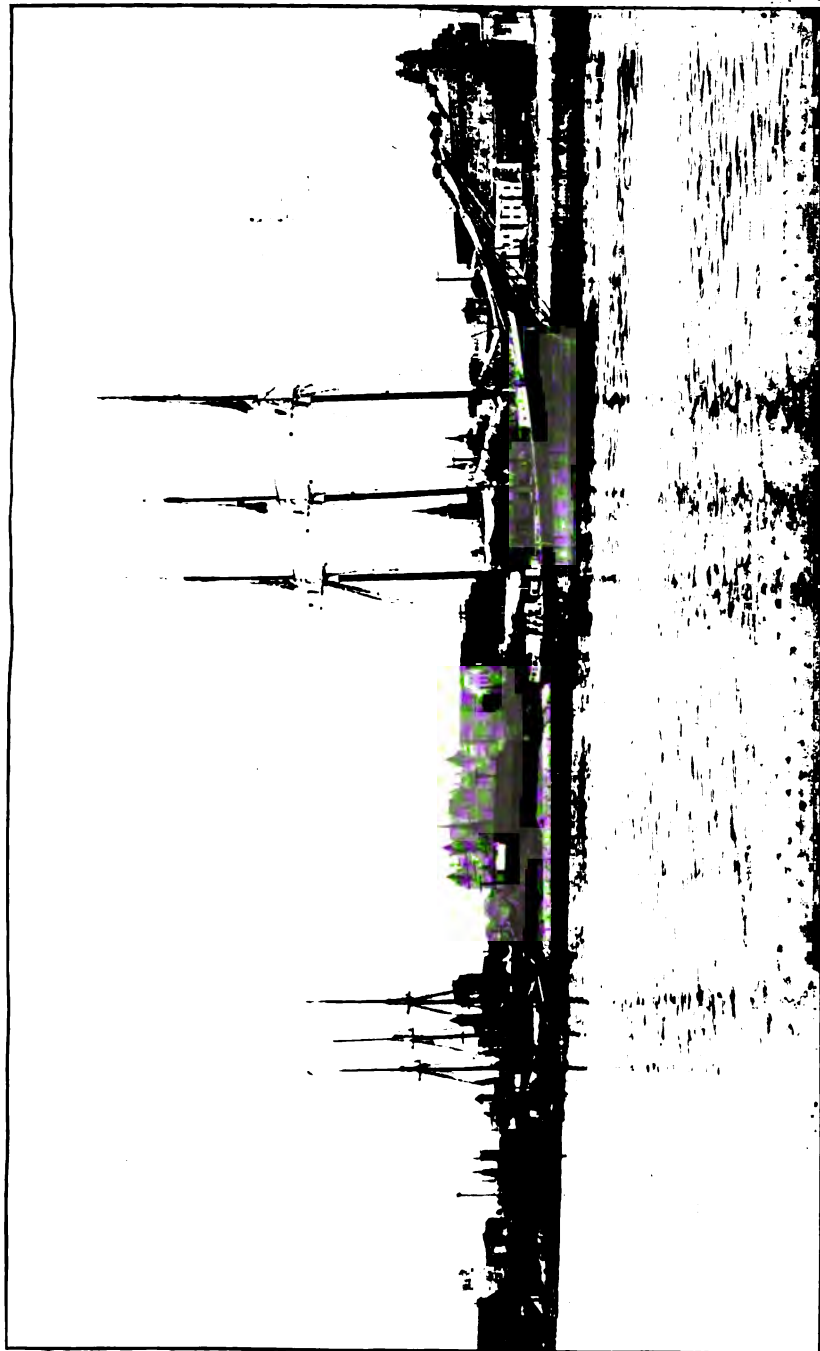
tional revenue, the amount of power within the limits of the state and available for industrial purposes would be increased and there could be no possible interference with any policy which the State may hereafter adopt in treating the general question of stream conservation. In these times, when conservation of energy has almost become our watchword, the failure to permit this surplus power to be put to some good and useful purpose is not in my opinion justifiable and I ask that you give the subject the most serious consideration.

#### SURVEYING AND MAPPING CANAL LANDS

During the past year considerable progress has been made in completing these surveys and maps. There have been presented to the Canal Board and that Board has given its approval to the maps covering the following sections: Champlain canal — Waterford to Northumberland and Guard-lock hill to Whitehall; Erie canal — Watervliet to Fort Hunter, city of Little Falls, east city line of Syracuse to Warners, Wayne-Seneca county line to Lyons, city of Rochester, including the Genesee River feeder.

The time is fast approaching when the lands occupied by such sections of the old canal as are to be permanently replaced by new channels will be no longer needed by the State. The original Barge canal estimate contemplated that these lands should be sold and the proceeds applied to the cost of construction of the new canals. Such is also the provision of the Barge canal referenda. If the proceeds are not thus applied, the construction estimates will fail of sufficiency. Any attempt to give the old canal lands away on any pretext whatsoever or to attempt to apply the proceeds from their sale to any purpose other than that specified should not be tolerated.

The municipalities through which the old canal passed are beginning to show an active interest with respect to its disposition, and in a number of cases definite plans are being made for the buying of these lands by such municipalities. The Canal Board has abandoned the section of the old canal lying within the limits of the city of Schenectady and the Land Board is causing the appraisal to be made with a view to disposing of the lands.



BARGE CANAL TERMINAL AT ALBANY

Two sea-going schooners and several canal boats are seen lying alongside the dockwall.

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## COURT OF CLAIMS SURVEYS

During the past year this Department has continued to furnish maps and reports to the Attorney-General and Claim Agent to aid in the preparation of the defense by the State against claims filed as the result of old canal operation and maintenance. I ask that the usual appropriation of \$5,000 be made to provide for the performance of similar work during the coming year.

## MISCELLANEOUS SURVEYS

During the past year the Department has been able to perform all of the work under this heading for which requests have been made, and the appropriation of \$10,000 was sufficient for the purpose. Previously, when only \$5,000 was allowed for this work, it was impossible to meet all the demands of other State departments and commissions. It is highly important that the State Engineer should have funds under his control to permit the making of these surveys and maps as they are from time to time requested by other departments, and I therefore recommend an appropriation of \$10,000 for such purpose.

## LAND GRANTS

Within the past two years the rules of the Land Board have been changed by chapter 308, Laws of 1917, relative to procedure to be followed in the granting of lands, and the State Engineer is charged with the making of investigations to determine if all the conditions under which the various grants were made have actually been carried out and to report his findings to the Attorney-General, who, if the occasion demands, will bring an action in the courts to annul the grants. To carry on these investigations and to make necessary corrections and additions to the official maps, I ask for an appropriation of \$4,000.

## COÖPERATIVE WORK WITH THE FEDERAL GOVERNMENT

To continue coöperative stream gaging work, which is of great value to the State, I recommend an appropriation of \$2,500, the same amount as allowed last year for this purpose.

Due to conditions imposed by the war, the United States Geological Survey has not during the present fiscal year proceeded

with the work of mapping New York state and I am as yet unable to obtain any definite assurances that it will be in a position to take up the work next year. In view of these conditions, I do not recommend the usual appropriation of \$15,000 for this purpose.

#### BOUNDARY LINES

During the year the work of restoring monuments on the Massachusetts boundary line has been completed, together with the restoring of monuments and the cutting out of the Canadian line, this latter work being performed in coöperation with the United States Boundary Line Commission. In addition an examination of the Pennsylvania boundary line was made and an estimate of cost prepared for the work necessary properly to restore the monuments and perform other incidental work. It appears from such estimate that the amount necessary to be expended by New York State for its share of this work is substantially \$40,000. In view of the extraordinary demands on the finances of the State just at this time, and believing that no great harm will result if these monuments are not immediately restored, I do not recommend an appropriation in sufficient amount to permit this State to coöperate with Pennsylvania during the coming year and recommend only an appropriation of \$1,000, to make the usual examinations of boundary lines, with which duty, in accordance with the law, the State Engineer is charged.

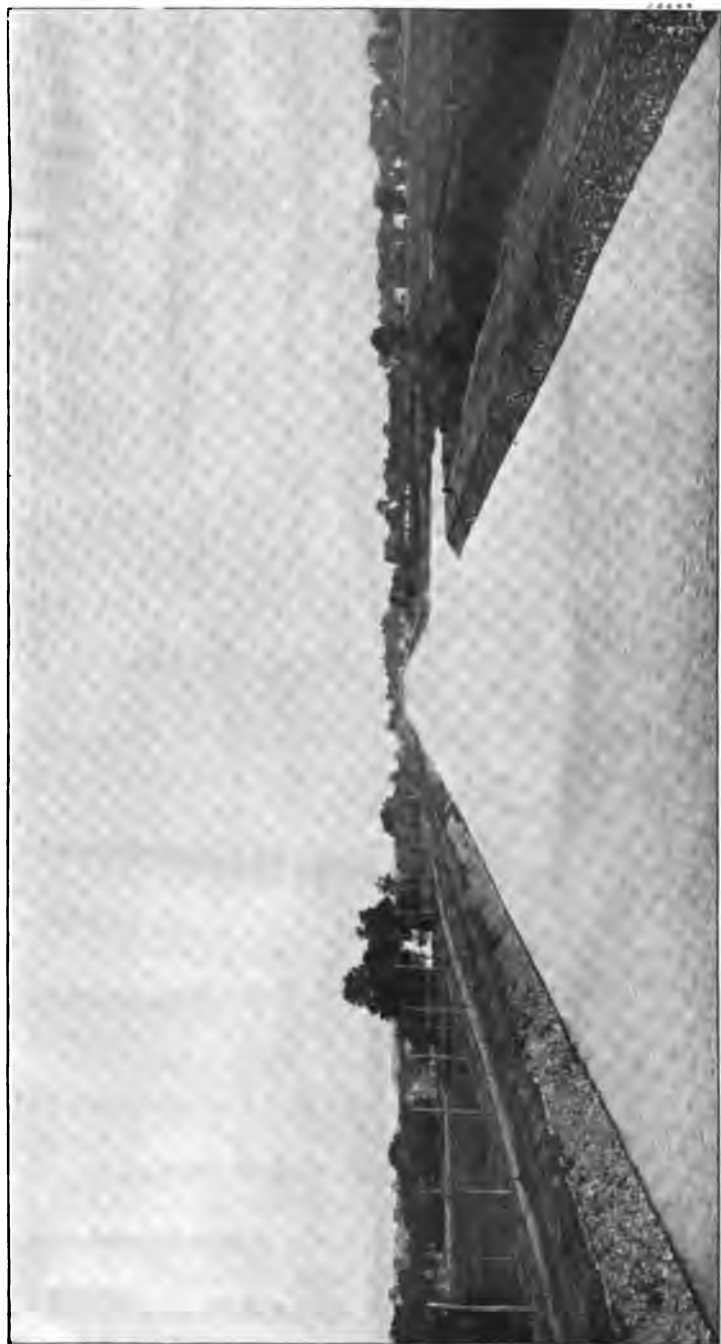
#### SPECIAL APPROPRIATIONS

This Department prepares plans and specifications and supervises the work of construction on many State projects other than canal construction. During the calendar year of 1917 work has been completed and final estimates prepared on the following contracts:

Foot-bridge on lock No. 3, Cayuga and Seneca canal (chapter 700, Laws of 1915).

Improvement of Mohawk river and West Canada creek (chapter 245, Laws of 1913; chapter 728, Laws of 1915).

Moose and Black river bridge at Lyons Falls (chapter 728, Laws of 1915; chapter 699, Laws of 1915).



TURNING BASIN IN THE BARGE CANAL

At frequent intervals in the western part of the state, where in general the channel is a land-line and wholly artificial, turning basins have been built. In the river-lines the natural topography generally furnishes such basins.



aside from those pertaining to his executive position, in number much exceeding any similar demands heretofore made upon that official. Aside from the four constitutional boards, namely, the Canal Board, Land Board, Board of Canvassers and Board of Equalization of Assessments, of which the State Engineer is a member, and the River Regulating Section of the Conservation Commission, I have during 1917 served as a member of the following:

State Council of Defense.

Hospital Development Commission.

Jamaica Bay-Peconic Bay Canal Board.

Acquisition of Land for Public Defense at Rockaway.

Committee to Investigate the Water-Powers of the State.

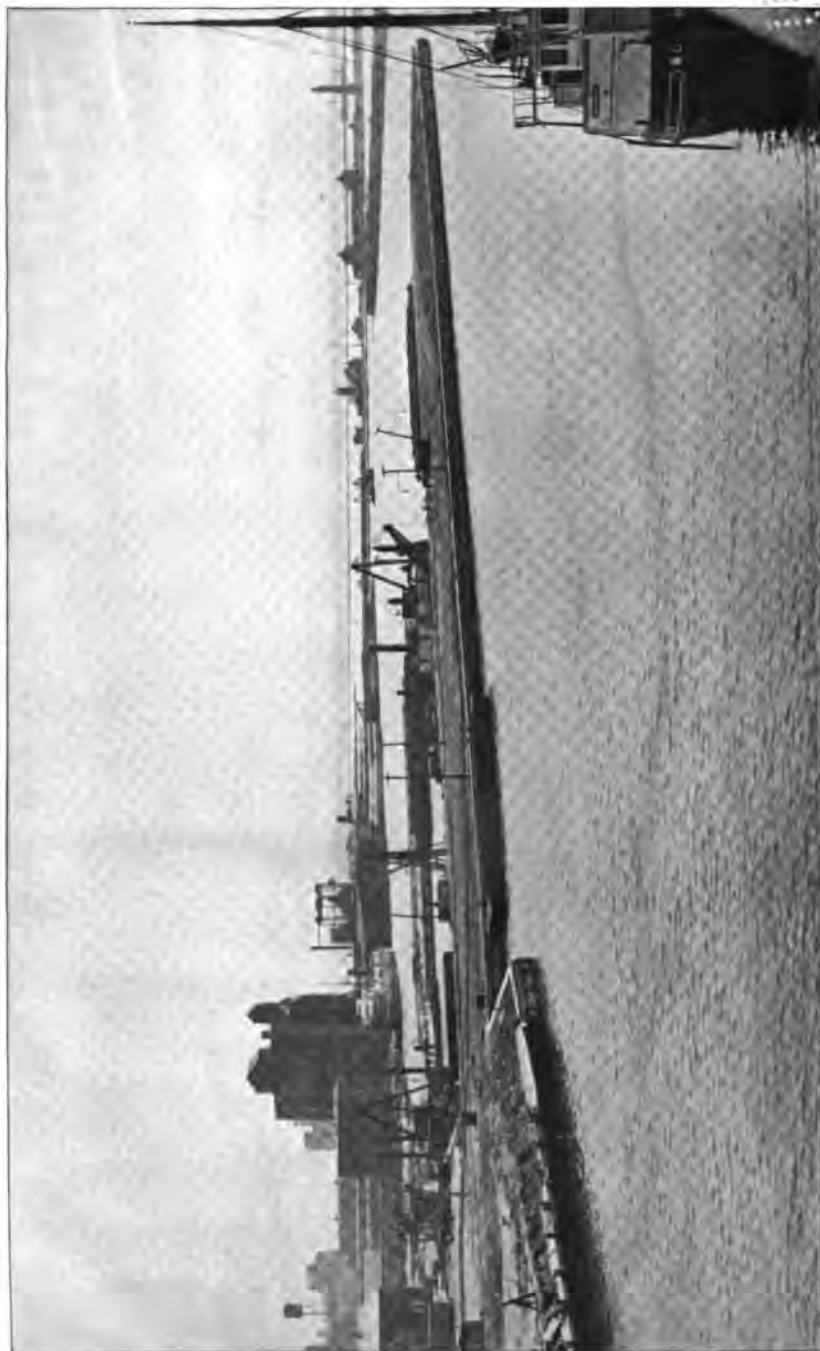
Interstate Bridge Commission.

Commission to Investigate Canal between Tonawanda and Buffalo.

#### APPENDED REPORTS

The usual reports are hereto appended. First come the tables giving summaries of engineering expenses. These are followed by tables of contracts, both those completed during the fiscal year and those in force at its close. Subsequently appear the reports of the three Division Engineers. These recount the progress made during the year in the various works of engineering and construction carried on in the Department, the chief of which has been the building of the Barge canal and its terminals. Besides containing the detailed accounts of work done, these reports are supplemented by tables showing engineering expenses on the several divisions and the status of contracts in force during the fiscal year. Other appended reports are those made by the engineers of this Department who are in charge of the Testing Laboratory, the Land Bureau and the Steam Gaging.

There has been prepared a volume which contains reproductions of standard plans of Barge canal structures and brief descriptions of the methods used in their design. This work is published as the third volume of this report.



BARGE CANAL TERMINAL AT BUFFALO

The two new piers and the three new slips of the canal terminal at Erie basin appear in the foreground. In the middle distance are the old and new Buffalo breakwaters and the lighthouse, between the inner and outer harbors. The Federal breakwater is seen in the background, protecting the outer harbor from Lake Erie.

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## ACKNOWLEDGMENTS

It is with a feeling of pride and satisfaction that I once again publicly acknowledge the efficient service rendered by my Deputies, Division Engineers and all employees of the Department.

Respectfully submitted,

FRANK M. WILLIAMS,  
*State Engineer and Surveyor.*



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**Engineering Expenses for the Fiscal Year Ended  
June 30, 1917**

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**Table of Contracts Completed During the Fiscal Year  
Ended June 30, 1916**

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**Table of Contracts Pending June 30, 1917**

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**Summary of Construction Work, Barge Canal, by Years**

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**Summary of Construction Work, Barge Canal  
Terminals, by Years**

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# Engineering Expenses for the Fiscal Year Ended June 30, 1917

## Ordinary Repairs to Canals

WORK	Act		Division	Amount	Total
	Chap.	Year			
Erie canal.....	646	1916	Eastern....	\$6,440 48	\$10,000 00
Champlain canal.....	646	1916	Eastern....	3,559 52	
Erie canal.....	646	1916	Middle.....	\$9,570 41	
Oswego canal.....	646	1916	Middle.....	61 25	
Cayuga and Seneca canal.....	646	1916	Middle.....	272 51	
Black River canal.....	646	1916	Middle.....	1 25	9,905 42
Erie canal.....	646	1916	Western....	\$10,000 00	10,000 00
Total.....	.....	.....	.....	.....	\$29,905 42

## Construction of Barge Canal

WORK	Act		Division	Amount	Total
	Chap.	Year			
Head office account.....	147	1903*	Eastern....	\$230,329 38	\$421,955 25
Erie canal.....	147	1903*	Eastern....	139,573 40	
Champlain canal.....	147	1903*	Eastern....	52,052 47	
Erie canal.....	147	1903*	Middle.....	\$104,395 22	165,224 53
Oswego canal.....	147	1903*	Middle.....	24,922 44	
Cayuga and Seneca canal.....	391	1909*	Middle.....	35,906 87	
Erie canal.....	147	1903*	Western....	\$127,788 75	127,788 75
Total.....	.....	.....	.....	.....	\$714,968 53

## Construction of Barge Canal Terminals

WORK	Act		Division	Amount	Total
	Chap.	Year			
Eastern division account.....	746	1911*	Eastern....	\$104,358 62	\$163,761 40
Middle division account.....	746	1911*	Middle.....	37,512 35	
Western division account.....	746	1911*	Western....	26,890 43	
Total.....	.....	.....	.....	.....	\$163,761 40

\* And amendatory laws.



*Bridge Designers, Engineers, Etc.*

WORK	Act		Division	Amount	Total
	Chap.	Year			
Bridge designers, engineers, etc....	646	1916	Eastern....	\$1,936 12	\$1,936 12

*Special Work*

WORK	Act		Division	Amount	Total
	Chap.	Year			
Improvement of Albany basin.....	646	1916	Eastern....	\$802 47	\$2,459 91
Improvement of Mohawk river and West Canada creek.....	245 728 181 735	1913 1915 1917 1917	Eastern....	562 70	
Schenectady-Scotia bridge.....	735	1917	Eastern....	275 17	
Construction of lock, Shinnecock and Peconic canal.....	728	1915	Eastern....	500 00	
Improvement of Three-Mile harbor.....	247 646 246 699	1914 1916 1913 1915	Eastern....	519 57	
Concrete bridge, Lyons Falls.....	699	1915	Middle....	\$3,745 88	
Yorkville bridge.....	745	1913	Middle....	1,477 23	
Minetto bridge.....	716	1915	Middle....	1,185 78	
Clinton street bridge, Whitesboro..	704	1915	Middle....	769 57	
Seneca Falls foot-bridge.....	709	1915	Middle....	321 98	
Chemung river improvement.....	732 728 760	1913 1915 1913	Western....	\$36 66	7,500 44
Canisteo river improvement.....	728 181 758	1915 1917 1913	Western....	3,527 30	
Chadakoin river improvement.....	728 181 624	1915 1917 1913	Western....	3,197 84	
Ellicott creek improvement.....	728 181	1915 1917	Western....	320 99	
Total.....	.....	.....	.....	.....	\$17,043 14

*Special Surveys*

WORK	Act		Division	Amount	Total
	Chap.	Year			
Blue line surveys.....	646	1916	Eastern....	\$20,900 00	
Examination of monuments and maps.....	530 728	1914 1915	Eastern....	2,189 84	
State boundary line.....	646	1916	Eastern....	714 89	
Compiling old records.....	521 728	1914 1915	Eastern....	840 00	
Topographic survey.....	646	1916	Eastern....	7,986 21	
Hydrographic survey.....	646	1916	Eastern....	1,248 78	\$33,829 72
Surveys, field notes, etc., Erie canal.	528	1914	Middle.....	\$1,329 37	
Blue line surveys, Erie canal.....	646	1916	Middle.....	10,982 78	
Surveys for State Court of Claims...	646	1916	Middle.....	1,474 47	13,786 62
Surveys for State Court of Claims...	646	1916	Western....	\$2,725 35	
Blue line surveys.....	646	1916	Western....	11,900 00	14,625 35
Total.....					\$62,241 69

*Summary of Engineering Expenses for the Fiscal Year Ended  
June 30, 1917*

DIVISION	Ordinary repairs to canals	Construction of Barge canal	Construction of Barge canal terminals	Bridge designs, engineers, etc.	Special work	Special surveys	Total
Eastern and head office...	\$10,000 00	\$421,955 25	\$104,386 68	\$1,936 12	\$2,459 91	\$33,829 72	\$574,596 62
Middle.....	9,985 42	166,224 83	37,512 36		7,500 44	13,786 62	233,929 36
Western.....	10,000 08	127,788 75	26,890 43		7,082 79	14,625 35	186,387 32
Totals.....	\$29,985 42	\$714,968 53	\$168,761 46	\$1,936 12	\$17,043 14	\$62,241 69	\$994,886 30

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1917  
Special Work

CONTRACTOR	Date of contract	Character of work	Division	Act		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
				Chap.	Year				
Lupfer & Remick.....	Sept. 8, 1914	Construction of a highway bridge over the canalized Mohawk river at movable dam No. 5, between the towns of Glenville and Rotterdam, Schenectady county...	Eastern..	714	1913	\$50,000 00	\$44,070 00	\$42,976 00	\$39,861 43
State Highway Construction Co., Inc.....				728	1915				
				181	1917				
J. S. Packard Dredging Co.....	Oct. 26, 1915	Improvement of the Mohawk river and West Canada creek.....	Eastern..	245	1913	*11,833 32	8,240 00	6,640 00	5,927 00
Harry H. Tuthill.....	Mar. 23, 1916	Improvement of Three-Mile harbor.....	Eastern..	728	1915				
Scott Brothers.....	April 1, 1916	Rebuilding Fire Island State Park dock...	Eastern..	181	1917				
				247	1914	10,000 00	8,500 00	8,500 00	8,213 00
				646	1916				
				727	1915	4,000 00	3,784 80	3,647 50	3,559 01
				181	1917				
M. Fitzgerald.....	Aug. 18, 1914	Constructing a bridge over the Erie canal in the village of Yorkville, Oneida county...	Middle...	745	1913	\$150,000 00	108,180 00	147,361 74	134,864 28
				584	1915				
				728	1915				
				181	1917				
C. E. Wells.....	Feb. 29, 1916	Construction of a new steel plate-girder bridge over the Erie canal at Clinton street, Whitesboro, Oneida county.....	Middle...	704	1915	11,000 00	9,089 50	9,671 90	8,767 76
				181	1917				
Lupfer & Remick.....	Oct. 21, 1915	Repairing the west wall of canal feeder on Main street, Oneida, Oneida county.....	Middle...	705	1915	4,000 00	3,527 50	3,570 08	2,861 30
				715	1913				
Lupfer & Remick.....	Oct. 16, 1914	Constructing a bascule bridge over the Erie canal at West Genesee street, Syracuse.	Middle...	728	1915	\$20,000 00	46,485 50	43,818 32	42,839 93
Eastover Construction Co., Inc.....	Mar. 23, 1916	Constructing a foot-bridge across fork No. 3 at Seneca Falls.....	Middle...	700	1915	5,000 00	4,001 00	4,388 10	4,037 42
				181	1917				
H. S. Kerbaugh, Inc.....	Oct. 18, 1915	Improvement of the Canastota river, Steuben county.....	Western..	750	1913	50,000 00	40,480 00	41,219 50	34,777 27
Henry P. Burgard Co.....	Sept. 27, 1915	Improvement of Sawyers creek, Niagara county.....	Western..	728	1915	10,000 00	8,600 00	9,440 00	8,980 22
				531	1914				
				646	1916				
	Feb. 14, 1916	Ordinary repairs — Making repairs to the dam at Tonawanda.....	Western..	529	1914		38,052 81	30,276 80	37,989 13

\* Reappropriation of unexpended balance from chapter 132, Laws of 1911.

† Additional sums were appropriated by the New York State Railway Co. and the Delaware, Lackawanna and Western Railroad Co.

‡ Additional sums were appropriated by the city of Syracuse and the New York State Railway Co.

## TABLE OF CONTRACTS COMPLETED

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*Construction of the Barge Canal*

Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
New York State Dredging Corp. ....	Feb. 17, 1914	Contract No. 18-A, Erie canal — Mindenville to Little Falls.....	Eastern.....	\$1,591,536 38	\$1,608,784 21	\$1,608,069 38
American Pipe & Construction Co. ....	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Rexford Falls to Yates.....	Eastern.....	2,260,000 00	3,151,104 40	3,148,447 74
John J. Farrell, Jr. ....	May 23, 1916	Contract No. 27-B, Champlain canal — Constructing a diversion channel for Bond creek, near lock No. 8.....	Eastern.....	9,725 00	6,845 00	6,042 52
Acme Engineering & Contracting Co. ....	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek.....	Eastern.....	2,650,500 00	2,751,261 12	2,911,229 68
James Stewart & Co., Inc. ....	April 15, 1910	Contract No. 39, Oswego canal — Three River Point to Fulton.....	Middle.....	972,900 00	1,032,551 20	953,694 90
Central Dredging Co.* ....	Mar. 22, 1916	Contract No. 47-A, Erie canal — Completing canal, east line of Wayne county to Lyons.....	Western.....	1,038,469 00	726,034 30	†193,720 00
James Stewart & Co., Inc.* ....	Mar. 27, 1913	Contract No. 72-A, Champlain canal — Hudson river, lower Medfordville to Stillwater.....	Eastern.....	1,398,585 50	1,534,603 25	1,515,095 31
Barrally & Ingersoll ....	Dec. 10, 1912	Contract No. 108, Oswego canal — Bridge at Phoenix.....	Middle.....	185,655 00	205,744 75	182,825 38
Lathrop, Shea & Henwood Co. ....	July 29, 1914	Contract No. 118, Erie canal — Highway bridge at Amsterdam.....	Eastern.....	153,093 00	154,806 00	152,580 17
Whitehead & Kales Iron Works ....	July 29, 1914	Contract No. 120, Erie canal — Reinforcement of movable dam Nos. 5 to 11, inclusive.....	Eastern.....	273,484 00	265,954 00	279,750 04
Great Lakes Dredge & Dock Co. ....	April 3, 1916	Contract No. 130, Erie canal — Improvement of Albany basin.....	Eastern.....	9,000 00	7,140 00	5,506 37
Holler & Shepard ....	Nov. 1, 1916	Contract No. 140, Champlain canal — Protection on west shore of Hudson river, five miles north of Waterford.....	Eastern.....	5,454 50	4,559 00	4,855 94
Horseheads Construction Co. ....	Jan. 4, 1917	Contract No. 145, Erie canal — Raising highway bridge at Schenectady.....	Eastern.....	5,092 00	3,978 00	3,765 08
James McKinney & Son. ....	Mar. 22, 1917	Contract No. 158, Erie canal — Barrel buoys and lamp posts.....	Middle.....	3,852 00	3,127 00	3,127 00
Larkin & Saugster ....	Jan. 11, 1913	Contract C, Cayuga and Seneca canal — Locks, dam, etc., at Seneca Falls.....	Middle.....	1,140,872 50	1,195,407 20	1,101,719 73
The Sherman-Stalter Co. ....	Feb. 24, 1914	Contract D, Cayuga and Seneca canal — From Demont's bridge through Waterloo.....	Middle.....	1,308,765 00	1,069,553 00	944,063 92
Lupfer & Remick. ....	Nov. 24, 1914	Contract G, Cayuga and Seneca canal — Lock-gates, etc., for locks Nos. 2, 3 and 4, needle-beam for dam No. 2, and Tainter gates at Waterloo.....	Middle.....	119,809 00	110,115 00	102,004 11

\* Relet to complete former contracts.

† This contract was canceled by the Canal Board March 22, 1917; the amount given is the value of work done as reported in the last monthly estimate.

**TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1917 — (Continued)**  
*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
John Shaw & Irving L. Taylor.....	May 20, 1916	Erie canal — Improvement of highway between Mohawk river and old Erie canal at Forts Ferry, town of Clifton Park, Saratoga county.	Eastern.....	\$3,915 00	\$3,210 50	\$2,486 85
Holler & Shepard.....	Sept. 8, 1916	Champlain canal — Relocating the highway east of the Hudson river, north of Moses kill, adjacent to contract No. 1-A.	Eastern.....	3,080 60	3,080 60	2,707 36
Jackson L. Richmond*.....	Sept. 2, 1914	Water-supply — Highways adjacent to Hinekey reservoir.	Middle.....	99,140 10	96,070 80	85,980 75
William L. O'Day.....	Sept. 5, 1914	Erie canal — Construction of road N, adjacent to contract No. 19.	Western.....		4,455 80	4,188 14
Myers & McWilliams.....	Nov. 4, 1915	Erie canal — Construction of culvert No. 30 at Irondequoit creek crossing.....	Western.....			<b>872,049 21</b>

\* This contract was completed prior to July 1, 1916, but the final estimate was not available for last year's report.

### *Construction of Barge Canal Terminals*

Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Patrik W. Mulderry.....	Nov. 12, 1915	Terminal contract No. 2-P — Paving terminal at Albany	Eastern.....	\$42,859 00	\$32,072 90	\$30,496 70
Eastover Construction Co.....	Jan. 8, 1913	Terminal contract No. 15 — Harbor, dockwall, connecting channel, etc., adjacent to Barge canal at Utica.	Middle.....	608,071 00	577,915 00	575,806 98
Geo. W. Rogers & Co., Inc.....	July 15, 1914	Terminal contract No. 18 — Dredging and constructing bulkheads and sewer at Gowanus bay.	Eastern.....	365,707 00	329,880 36	304,061 48
Scott Brothers.....	Aug. 31, 1915	Terminal contract No. 46 — Dockwall and approach, west of Westport bridge.	Middle.....	16,331 00	13,658 00	11,456 87
I. M. Ludington's Sons, Inc.....	Oct. 5, 1915	Terminal contract No. 47 — Raising dockwalls and paving at Tonawanda and North Tonawanda.	Western.....	44,660 00	38,361 80	36,045 92
Fred H. Rhoady.....	Feb. 16, 1916	Terminal contract No. 51 — Raising dockwalls and grading and surfacing site at Medina.	Western.....	6,379 00	5,325 00	4,362 65
Collins Brothers.....	Dec. 29, 1916	Terminal contract No. 203 — Warehouses at Troy, Mechanville, Fort Edward and Port Henry.	Eastern.....	3,605 00	3,244 55	3,063 78
J. B. McCabe & Son.....	Jan. 29, 1917	Terminal contract No. 206 — Temporary warehouses at Spencerport and Holley.....	Western.....	<b>1,630 00</b>	<b>1,440 00</b>	<b>1,397 50</b>

TABLE OF CONTRACTS PENDING JUNE 30, 1917  
Special Work

CONTRACTOR	Date of contract	Character of work	Division	Act		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
				Chap.	Year				
Walter S. Rao.....	Oct. 25, 1915	Continuing and completing construction of bridge over Black and Moose rivers at Lyons Falls, Lewis county.....	Middle...	{ 899 } { 728 } { 646 }	{ 1915 } { 1917 } { 1918 }	*\$37,838.44	\$59,383.00	\$61,541.80	\$56,370.00
Latkin & Sangster.....	Sept. 12, 1916	For constructing portions of a bridge over the Otsego river at Middleburg. (Part of Barge canal contract No. 99).....	Middle...	{ 716 } { 181 } { 654 }	{ 1915 } { 1917 } { 1913 }	50,000.00	44,088.15	42,988.15	16,080.00
E. T. Darrow & Son.....	Dec. 17, 1918	Repairing west pier at foot of Owaseco lake and dredging Owaseco outlet.....	Middle...	{ 728 } { 181 } { 624 }	{ 1915 } { 1917 } { 1913 }	20,400.00	17,814.80	17,652.80	11,980.00
Frank L. Cohen†.....	Dec. 10, 1914	Improvement of Ellicott creek, Erie county.....	Western...	{ 728 } { 1915 }		80,000.00	69,867.71	65,326.75	41,140.00
Geo. L. Maltby.....	Mar. 23, 1916	Improvement of Chataquo river, Chautauqua county.....	Western...	{ 758 } { 1913 }		100,000.00	89,252.25	92,074.25	5,400.00

\* This figure includes \$37,838.44 reappropriated from the unexpended balance from chapter 246, Laws of 1913, and a new appropriation of \$30,000.00.

† This contract was canceled by the Canal Board June 20, 1916, but the final account has not been approved.

TABLE OF CONTRACTS PENDING JUNE 30, 1917 — (Continued)

## Construction of the Barge Canal

Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Holler & Shepard *	Aug. 31, 1914	Contract No. 1-A, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward.	Eastern	\$90,811 00	\$133,095 40	\$162,540 00
A. A. Parker	Oct. 17, 1916	Contract No. 2-G, Erie canal — Spillway, Taintor gate and operating equipment, Watford side-cut.	Eastern	9,686 00	11,769 85	11,260 00
H. S. Kerbaugh, Inc.	Nov. 3, 1916	Contract No. 19-A, Erie canal — Reddredging contract No. 19 and incidental work.	Western	152,200 00	169,750 10	9,890 00
Walsh Construction Co. *	Feb. 16, 1916	Contract No. 21-A, Erie canal — Completing canal, 400 feet west of Genesee river to N. Y. C. R. R. crossing.	Western	415,700 00	384,928 69	231,970 00
H. S. Kerbaugh, Inc. *	May 20, 1916	Contract No. 23-A, Erie Canal — Completing canal, King's Bend to Genesee river.	Western	651,703 10	627,568 42	142,250 00
Eastover Construction Co. *	Mar. 27, 1916	Contract No. 29-A, Erie canal — Completing the canal from Sterling creek to Herkimer-Oneida county line.	Eastern	192,005 00	318,659 70	159,380 00
Mohawk Dredge & Dock Co. *	Nov. 24, 1916	Contract No. 30-A, Erie canal — Completing the canal from Jacksonville to Herkimer.	Eastern	122,013 00	128,182 00	79,610 00
Grant Smith & Co., & Locher *	Feb. 24, 1913	Contract No. 42-A, Erie canal — Herkimer-Oneida county line to Oriskany road.	Middle	1,033,037 85	1,239,045 03	1,139,680 00
The M. A. Talbott Co.	Oct. 15, 1909	Contract No. 43, Erie canal — Oriskany road to Mud creek.	Middle	1,529,885 00	1,388,080 05	1,287,780 00
Scott Brothers	Oct. 10, 1916	Contract No. 44-A, Erie canal — Prism near junction lock at New London.	Middle	57,050 00	52,486 00	36,140 00
James Stewart & Co., Inc. *	Sept. 2, 1914	Contract No. 46-A, Erie canal — Fox Ridge to Montezuma aqueduct.	Middle	333,941 50	196,133 50	157,750 00
Scott Brothers *	Feb. 25, 1916	Contract No. 46-B, Erie canal — Lock, dam, etc., at May's Point.	Middle	314,660 72	277,348 22	144,190 00
Alto Construction Co.	Dec. 23, 1910	Contract No. 51, Water-supply — Feeder from Trenton Falls on West Canada creek to Nine-Mile creek.	Middle	424,710 00	414,869 85	353,780 00
MacArthur Bros. Co.	Nov. 3, 1916	Contract No. 59, Erie canal — Constructing canal between contracts Nos. 21-A and 23-A at Genesee river, and Rochester harbor.	Western	1,675,252 86	1,601,279 11	41,520 00
P. H. Murray	July 3, 1916	Contract No. 59-A, Erie canal — Sewer from Genesee Valley park, Rochester.	Western	124,260 55	110,689 45	71,140 00
State Highway Construction Co. *	Feb. 23, 1916	Contract No. 63-A, Erie canal — Completing canal, Wayne-Monroe county line to King's Bend.	Western	567,745 70	500,603 20	262,520 00

# TABLE OF CONTRACTS PENDING

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Central Dredging Co.*	Oct. 22, 1912	Contract No. 70-A, Champlain canal — Hudson river, Watford to lock No. 1	Eastern.....	790,488 00	759,158 88	751,490 00
James Stewart & Co., Inc.	July 7, 1916	Contract No. 72-B, Champlain canal — Widening prism at mouth of Hoosic river	Eastern.....	207,700 00	108,540 00	91,100 00
Great Lakes Dredge & Dock Co.*	Jan. 15, 1916	Contract No. 73-A, Champlain canal — Completing the canal from Northumberland to Stillwater	Eastern.....	432,045 00	458,265 67	318,140 00
Dunbar & Sullivan Dredging Co.	Feb. 13, 1914	Contract No. 74, Erie canal — Hudson river and Mohawk river at Watford	Eastern.....	256,372 00	240,872 00	200,670 00
Chesley, Earl & Heimbach, Inc.	Oct. 17, 1916	Contract No. 81, Erie canal — Junction lock at Rome	Middle.....	61,236 40	54,685 90	45,680 00
Lupier & Remick	Mar. 9, 1917	Contract No. 84, Erie canal — Viaduct over Clyde river at Clyde	Western.....	83,984 50	83,876 60	17,520 00
The Holington Co.	Jan. 5, 1911	Contract No. 91, Erie canal — Hydro-electric power-plant at Crescent dam	Eastern.....	44,600 00	44,985 50	43,710 00
Lord Construction Co.	Nov. 24, 1916	Contract No. 91-A, Erie canal — New governor equipment for hydro-electric power-plant at Crescent dam	Eastern.....	6,310 00	5,930 00	5,350 00
Tift Construction Co., Inc.	Nov. 24, 1916	Contract No. 98, Erie canal — Adams street lift-bridge, Lockport	Western.....	77,496 60	82,276 25	20,250 00
Larkin & Sangster	Sept. 12, 1916	Contract No. 99, Oswego canal — Bridge over Oswego river at Minetto	Middle.....	172,992 60	173,082 60	1330 00
Thomas Leonard	Feb. 23, 1916	Contract No. 122, Erie canal — Highway bridge near Little Falls	Eastern.....	59,339 50	56,615 00	6,090 00
Chesley, Earl & Heimbach, Inc.*	Mar. 8, 1917	Contract No. 122-A, Erie canal — Completing highway bridge near Little Falls	Eastern.....	52,717 00	67,053 10	3,230 00
Holler & Shepard	May 27, 1916	Contract No. 128, Champlain canal — Highway bridge at Northumberland	Eastern.....	77,751 50	76,480 70	59,210 00
The Foundation Co.	June 6, 1916	Contract No. 129, Erie canal — Freeman's bridge	Eastern.....	80,976 50	88,470 80	35,340 00
Spaulding Construction Co.	Mar. 28, 1916	Contract No. 131, Champlain Canal — Portions of a highway bridge at Schuylerville	Eastern.....	31,248 00	29,734 00	850 00
M. Fitzgerald*	Mar. 5, 1917	Contract No. 131-A, Champlain canal — Completing portions of a highway bridge at Schuylerville	Eastern.....	30,753 00	39,634 50	420 00
Lupier & Remick	Nov. 3, 1916	Contract No. 132, Erie canal — Lighthouses, range towers, beacons, etc.	Middle.....	63,937 00	70,330 20	40,270 00
Morrison & Quinn, Inc.	Oct. 16, 1916	Contract No. 133, Erie canal — Junction lock at Mohawk	Eastern.....	47,534 00	48,638 80	36,820 00
Great Lakes Dredge & Dock Co.	Sept. 18, 1916	Contract No. 135, Erie canal — Widening the prism at Canaloharie	Eastern.....	78,052 00	57,038 00	39,220 00
J. A. Laporte	Oct. 13, 1916	Contract No. 137, Erie canal — Sheet-piling at dam No. 10, Canaloharie	Eastern.....	25,333 00	22,650 00	13,170 00
Combined Construction Co.	April 19, 1917	Contract No. 138, Erie canal — Movable dam, etc., at Rochester	Western.....	302,700 30	321,115 12	700 00
H. S. Kerbaugh, Inc.	Nov. 3, 1916	Contract No. 139, Oswego canal — Lock No. 8 to deep water in Lake Ontario	Middle.....	25,280 00	25,912 00	17,130 00
W. F. Maas & Son	Mar. 8, 1917	Contract No. 141, Erie canal — Power-station at lock No. 29, Palmyra	Western.....	41,166 50	41,180 75	4,830 00
W. F. Martens & Co., Inc.	June 14, 1917	Contract No. 144, Erie canal — Two concrete bridges over Red creek, Genesee Valley park, Rochester	Western.....	41,480 70	41,258 70	130 00

\* Relet to complete former contracts.

† These figures do not include the portion of this contract under chapter 718, Laws of 1915. See "Special Work."

‡ Part of this bridge was built under contract No. 88.



TABLE OF CONTRACTS PENDING JUNE 30, 1917 — (Continued)  
*Construction of the Barge Canal — (Continued)*  
 Chapter 147, Laws of 1903; chapter 891, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Brown & Lowe Co.	Dec. 1, 1916	Contract No. 150, Erie canal — Apron below head-gates at Vischer Ferry dam.	Eastern	\$20,300 00	\$21,780 00	\$20,980 00
R. B. Wing & Son.	Feb. 28, 1917	Contract No. 153, Erie and Oswego canals — Buoy, stake and bridge lanterns on the Mohawk, Oneida, Seneca and Oswego rivers.	Eastern and Middle	4,200 00	4,380 00	0 00
Lupfer & Remick.	April 7, 1917	Contract No. 154, Erie canal — Additional Taintor gate, lock No. 27, Lyons.	Western	7,802 70	8,582 60	0 00
Lupfer & Remick.	Jan. 31, 1917	Contract No. 155, Erie canal — Hoists for bulkhead gates, Vischer Ferry dam.	Eastern	9,998 00	11,586 00	2,850 00
Thomas Bowen.	April 20, 1917	Contract No. 157, Erie canal — Dam across old Erie canal at Rome.	Middle	4,934 00	6,247 50	500 00
I. M. Ludington's Sons, Inc.	Mar. 27, 1917	Contract No. 159, Erie canal — Extending Ganargus creek spillway and raising canal banks nearby.	Western	30,464 00	28,476 00	6,230 00
Charles A. Ingereoll.	Mar. 27, 1917	Contract No. 162, Erie canal — Drain at Main street, Brockport.	Western	6,173 90	7,208 30	6,240 00
Holler & Shepard.	June 28, 1917	Contract No. 169, Champlain canal — Temporary cribs below locks Nos. 8 and 6.	Eastern	3,508 00	8,086 00	0 00
The Sherman-Stalter Co.	July 24, 1916	Contract A-1, Cayuga and Seneca canal — Fish-ladder and repairs to dam No. 1.	Middle	29,019 30	26,842 50	24,140 00
Stanley Construction Co.	July 20, 1914	Contract F, Cayuga and Seneca canal — Free, Demont's and Lake road bridges.	Middle	126,268 00	142,578 70	120,160 00
Scott Brothers.	Sept. 28, 1915	Contract L, Cayuga and Seneca canal — Bridges at Gorham street and Kingdom road.	Middle	71,469 28	59,928 40	53,010 00
Lupfer & Remick.	Nov. 5, 1914	Contract M, Cayuga and Seneca canal — Electrical and operating equipment for locks Nos. 1, 2, 3 and 4.	Middle	179,087 00	191,436 00	185,100 00
The Foundation Co.	June 8, 1917	Contract P, Cayuga and Seneca canal — Concrete cut-off wall under lock No. 3.	Middle	76,412 50	82,850 00	0 00

*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character or work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Harry A. Schaupp.....	Jan. 17, 1916	Erie canal — Connecting highways, Muck road to James street and Whitesboro street to Mill street, Rome.....	Middle.....	\$28,634 55	\$32,111 50	\$20,130 00
The Sherman-Stalter Co.....	Mar. 27, 1917	Erie canal — Completing contract No. 47-A, east line of Wayne county to Lyons.....	Western.....	.....	.....	207,566 58

TABLE OF CONTRACTS PENDING JUNE 30, 1917 — (Concluded)  
*Construction of Barge Canal Terminals*  
 Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Kendar Engineering & Construction Corp., Inc.	Dec. 29, 1914	Terminal contract No. 13 — Guard-lock, highway bridge and cut-off dam at Schuylerville.	Eastern	\$61,664 60	\$42,742 80	*\$38,190 00
E. Brown Baker	June 4, 1917	Terminal contract No. 16 — Paving terminal at Rome.	Middle	3,300 00	3,909 50	0 00
McHarg-Barton Co.	Nov. 24, 1916	Terminal contract No. 19 — Dredging and constructing bulkhead wall and pier, and repairing two piers and a bulkhead at Greenpoint.	Eastern	193,500 00	207,383 00	25,280 00
Walsh Construction Co., Inc.	Nov. 4, 1915	Terminal contract No. 20 — Terminal basin with connecting channel to Onondaga lake at Syracuse.	Middle	685,875 00	566,753 26	377,880 00
H. S. Kerbaugh, Inc.	Jan. 12, 1914	Terminal contract No. 21 — Harbor, piers, bulkheads, etc., in Erie basin, Buffalo.	Western	1,513,925 00	801,972 30	560,120 00
John E. Byron & Co.	Oct. 30, 1916	Terminal contract No. 26 — Dredging and constructing pier at Rouses Point.	Eastern	51,200 00	55,678 50	4,010 00
Barrally & Ingersoll	Feb. 15, 1915	Terminal contract No. 28 — Harbor dockwall and breakwater on Onondaga lake at Cleveland.	Middle	34,575 00	37,222 00	28,790 00
Barrally & Ingersoll	Nov. 27, 1914	Terminal contract No. 29 — Harbor dockwall and breakwaters on Onondaga lake at Constantia.	Middle	43,573 50	39,793 50	3,400 00
Henry P. Burgard	Mar. 24, 1916	Terminal contract No. 30 — Dockwall and approach on east side of Oswego river at Oswego.	Middle	103,700 00	106,583 10	71,700 00
Lunfer & Remick	Sept. 30, 1916	Terminal contract No. 31 — Terminal at Lyons.	Western	37,925 00	51,653 80	16,500 00
H. S. Kerbaugh, Inc.	July 10, 1914	Terminal contract No. 33 — Terminal pier, channels, etc., at the east end of West First street, Oswego.	Middle	415,420 00	351,175 50	332,940 00
Troy Public Works Co.	Mar. 27, 1917	Terminal contract No. 36 — Dredging and dockwall at Cohoes.	Eastern	61,000 00	57,600 00	0 00
Holler & Shepard	Aug. 26, 1915	Terminal contract No. 37 — Dockwall and harbor at Canajoharie.	Eastern	33,832 00	32,272 00	13,380 00
Fred H. Rhoady	Mar. 29, 1917	Terminal contract No. 39 — Terminal at Albion.	Western	2,700 00	2,952 50	2,100 00
Scott Brothers	Sept. 20, 1915	Terminal contract No. 40 — Dockwall and harbor at St. Johnsville.	Eastern	27,963 00	27,762 37	22,980 00
Geo. W. Rogers Co., Inc.	June 8, 1917	Terminal contract No. 44 — Terminal at Mott Haven.	Eastern	170,300 00	193,651 00	20,680 00
M. H. Ripton	Oct. 19, 1916	Terminal contract No. 48 — Terminal on east side of Genesee river, Rochester.	Western	101,000 00	93,828 00	25,480 00

## TABLE OF CONTRACTS PENDING

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Kaufman & Garvey.....	July 27, 1916	Terminal contract No. 52 — Terminal at Pier 6, East river, New York city.....	Eastern.....	89,974 00	109,357 75	53,660 00
Walsh Construction Company.....	Oct. 27, 1916	Terminal contract No. 53 — Terminal at Ohio basin, Buffalo.....	Western.....	571,800 00	532,584 00	11,090 00
Hammond-Tracy Construction Co., Inc.....	Mar. 27, 1917	Terminal contract No. 54 — Terminal at Middleport.....	Western.....	1,250 00	1,234 00	640 00
E. Brown Baker.....	Dec. 18, 1916	Terminal contract No. 101 — Stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda.....	Eastern, Middle and Western.....	21,890 90	31,790 90	0 00
J. A. Laporte.....	Jan. 2, 1917	Terminal contract No. 201 — Terminal warehouses at Albany and Whitehall.....	Western.....	59,300 00	65,174 85	2,530 00
Kennedy & Scullen.....	Mar. 12, 1917	Terminal contract No. 204 — Temporary terminal warehouses at Schenectady, Amsterdam, Fonda, Ilion and Frankfort.....	Eastern.....	4,765 00	19,000 00	18,470 00
William R. Kimmey.....	Mar. 14, 1917	Terminal contract No. 205 — Temporary terminal warehouses at Utica and Rome.....	Eastern.....	2,320 00	13,906 75	12,830 00
Kennedy & Scullen Construction Co.....	May 7, 1917	Terminal contract No. 208 — Temporary terminal warehouses at Fort Plain and Little Falls.....	Eastern.....	9,140 00	9,278 76	8,820 00
G. J. and P. L. Metzger.....	June 4, 1917	Terminal contract No. 209 — Frame warehouses at Tonawanda and North Tonawanda.....	Western.....	7,892 00	7,535 00	480 00
Savage Construction Company.....	June 1, 1917	Terminal contract No. 210 — Frame warehouses at upper and lower terminal sites at Lockport.....	Western.....	9,955 00	9,903 00	4,040 00
W. F. Martens & Co., Inc.....	June 14, 1917	Terminal contract No. 211 — Frame warehouses at Newark, Albion and Medina.....	Western.....	8,800 00	8,002 00	2,280 00

\* Terminal contract No. 13 was suspended by the Canal Board, February 23, 1916. The work on this contract has all been done by the Superintendent of Public Works.



1915.....	19,731	11,434	50,954	82,119	11,064	4,130	67,343	2,936
1916.....	8,728	10,355	436	19,519	290	276	20,065	66,709
1917.....	12,669	3,714	8,893	26,808	1,844	10,217	87,367	8,845
Total.....	\$252,797	\$74,759	\$765,500	\$1,093,056	\$177,889	\$44,554	\$1,315,499	\$90,079

\* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

Note.—This table includes work done under the supervision of this Department, excepting highways which were relocated or rebuilt. It includes all the Barge canal work shown in the three tables published in the *Barge Canal Bulletin* for July, 1917, except work to the value of \$16,080 done under contract No. 99, but payable from a special appropriation. Also the following items are included: Work done by the Superintendent of Public Works on old contract No. 17 to the value of \$3,400; completing contract No. 20-D, \$22,413; supporting the superstructure of Weedsport bridge on contract No. 22, \$12,447; completing prison and placing wash wall on contract No. 25, \$6,029; completing work on contract No. 47-A, \$207,597; culvert No. 30 at crossing of Irondequoit creek, \$372,549; shelter at Delta dam, \$2,234; and three sums due to the difference between the last monthly estimate and the final estimate — on contract No. 20-D, \$23,838; on contract No. 118, \$1,660; and on contract No. 120, \$150.

**SUMMARY OF CONSTRUCTION WORK—BARGE CANAL TERMINALS**  
 Value of work done under Barge canal terminal contracts, summarized by years and canals

YEAR*	VALUE OF WORK DONE						
	Erie Canal			Champlain canal	Oswego canal	Cayuga and Seneca canal	New York city
	Eastern Division	Middle Division	Western Division				
1912	\$261,040	\$97,960	\$22,410	\$381,430	\$154,110	\$23,870	\$19,330
1913	356,021	338,440	162,687	860,148	231,946	16,666	212,530
1914	172,826	194,325	202,990	570,141	87,333	139,170	14,630
1915	27,620	116,670	115,422	259,712	70,393	108,210	157,811
1916	69,635	349,464	212,547	631,646	25,436	155,740	—
1917	—	—	—	—	—	—	—
Totals	\$890,142	\$1,095,879	\$716,055	\$2,703,077	\$559,217	\$40,536	\$404,381
							\$2,959,410
							1,119,000
							1,000,173
							443,038
							870,633
							\$4,111,731

Extra Work Orders Paid						
1914	—	—	—	\$2,033	—	—
1915	—	—	—	2,910	—	—
1916	\$1,500	\$1,500	\$150	1,130	—	—
1917	1,672	6,355	756	8,763	\$855	—
Totals	\$3,172	\$6,806	\$906	\$10,884	\$855	—
						\$18,876
						\$30,009

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.  
 Note.— The above table includes all the Barge canal terminal work shown in the table published in the *Barge Canal Bulletin* for July, 1917, and three sums due to the difference between the last monthly estimate and the final estimate as follows: On terminal contract No. 16, \$1,281; on terminal contract No. 46, \$227; and on terminal contract No. 206, \$208.

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**REPORT**  
**OF THE**  
**DIVISION ENGINEER**  
**OF THE**  
**EASTERN DIVISION**

**For the Fiscal Year Ended June 30, 1917**





## EASTERN DIVISION

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STATE OF NEW YORK

DEPARTMENT OF STATE ENGINEER AND SURVEYOR

EASTERN DIVISION

ALBANY, N. Y., July 2, 1917.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, N. Y.*:

Sir.—As has been the case for the past eight years, the principal work coming under the supervision of the Division Engineer of the Eastern Division, during the fiscal year just ended, has been connected with the construction of the Barge canal structures and prism and the Barge canal terminals. During this year the Barge canal throughout the entire Division has been opened to navigation, that part on the Erie canal from Jacksonburg to the western limits of the Division, the Herkimer-Oneida county line, and westerly therefrom being first opened for traffic at the beginning of the present navigation season.

Eleven Barge canal contracts and three terminal contracts have been accepted during the year. Final estimates were approved by the Canal Board during the year for eight of these Barge canal contracts and two of these terminal contracts. The improvement of Three-Mile harbor and the improvement of West Canada creek were completed and also this Department has supervised the rebuilding of Fire Island State Park dock.

The requests of other State departments for surveys and maps have been met, while the surveys of the blue line of the old canal have continued.

There follows a brief statement of the work accomplished on the Barge canal and of the other matters which have been under my jurisdiction during the fiscal year.

### BARGE CANAL CONSTRUCTION

(Chapter 147, Laws of 1903, and amendatory laws)

The Eastern Division includes all that portion of the Erie canal extending from the Hudson river at Waterford to the Her-

kimer-Oneida county line and the entire Champlain canal from Waterford to Whitehall at the southern extremity of Lake Champlain, the combined length of both channels being approximately 190 miles.

### *Erie Canal*

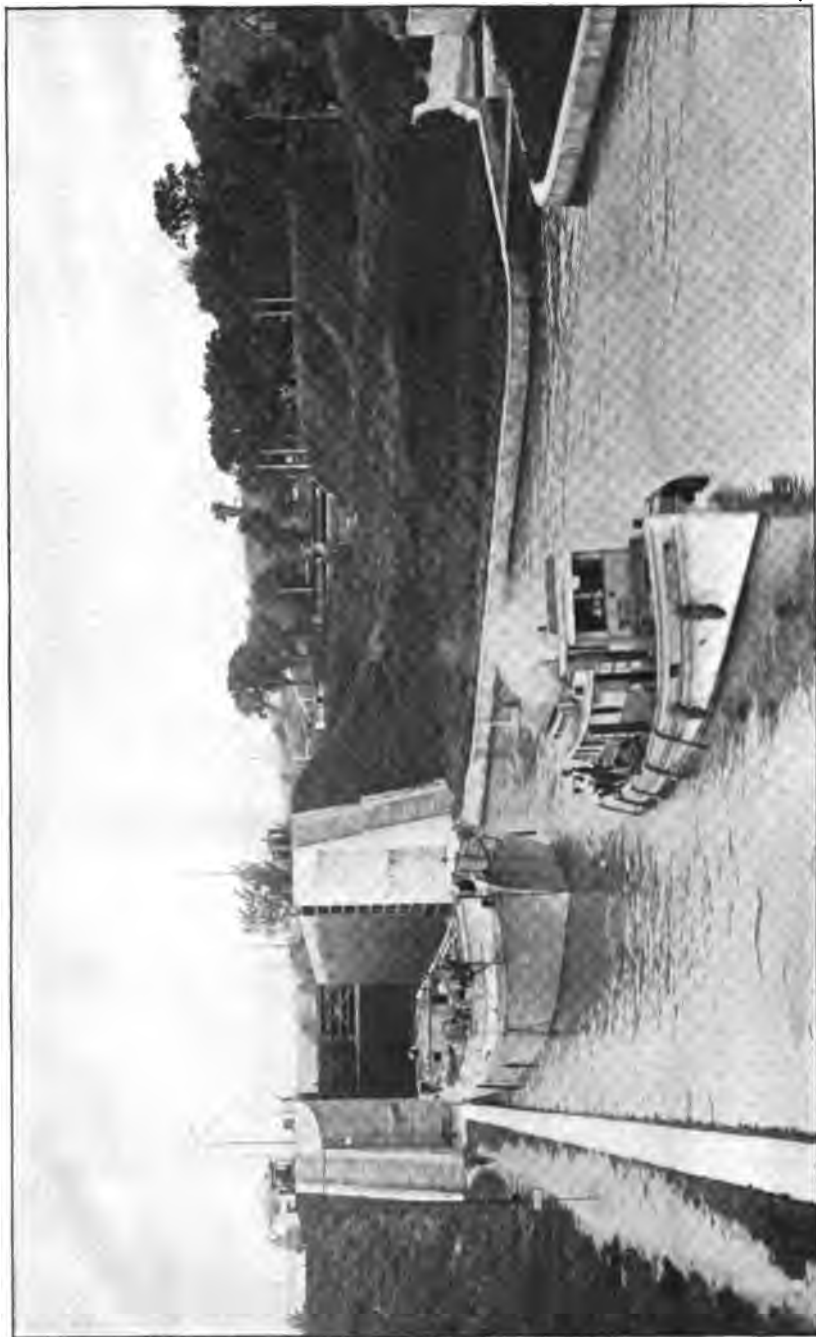
The Erie branch of the Barge canal channel extending from the Hudson river at Waterford to Frankfort has been opened to navigation. Contract No. 29-A, at the western end of the Division, and contract No. 30-A, in the vicinity of Herkimer, are still under construction, but boats with a draft of eight feet can pass through.

The Mohawk river and its tributaries are subject to sudden rises, and at such times, as well as during the regular spring floods, silting will occur at stream entrances and other points. As the regimen of the river becomes adjusted to the changes made by the construction of the movable dams and the canal prism, the erosion and silting will under ordinary conditions become gradually less in amount. However, it will require continual work to maintain the prism at its full depth and width. Practically the entire channel has been swept during the year and the location of bars has been furnished the Superintendent of Public Works.

### *Champlain Canal*

The section of the Champlain canal lying between Fort Edward and Whitehall had been entirely completed and was turned over to the Superintendent of Public Works three years ago, as was the land-line section between Fort Miller and Crocker's Reef.

As would be expected, many floods since that time have washed considerable material into the prism and some silt bars have been formed. As the depth was sufficient to permit the passage of canal boats of the old type, no effort was made to dredge out these bars until the past season. The Superintendent of Public Works was engaged in doing this work during the last season and inasmuch as these bars were neither numerous nor of considerable extent their removal was practically finished during the past summer. Just south of Fort Edward there is a section of river canalization about five miles in length which has a rock bottom on



Early in the season of 1917 the large boat shown in this view, which was formerly used on the Great Lakes, was partially dismantled and towed through the Barge canal, for use on the ocean. Since the canal has been opened it has frequently been used for transporting large craft for port or ocean service.



which there are some high points remaining. The work of removing these points has proceeded under contract No. 1-A, and by placing flash-boards on the Crocker's Reef dam, which is State owned, a channel was provided through this section which has an eleven-foot depth. This is now being deepened to the requisite twelve-foot depth.

Between Northumberland and Stillwater excavating of the channel has proceeded under contract No. 73-A, which comprises several disconnected sections of river. There is, however, no section of this work at which there is not an available channel at least 60 feet wide and 10 feet deep.

From Stillwater south to Troy the channel has all been completed with the exception of contract No. 70-A, which is certain to be completed during the present season.

The narrows of Lake Champlain come under the supervision of the United States Government and for a number of years it has been urged that the United States Government make provision for deepening these narrows to correspond to the Barge canal depth of 12 feet. This has been provided for in the last Rivers and Harbors bill introduced in Congress, and there is good reason to expect that the availability of the Champlain canal will not be seriously delayed, owing to the Government work which must be accomplished before barges of the newer types are to pass into Lake Champlain.

#### BARGE CANAL TERMINALS

The Barge canal terminals which have been under contract on the Erie canal, with the exception of that at Canajoharie, and on the Champlain canal, with the exception of Cohoes and Rouses Point, have been completed. These three terminals are now under contract, that at Canajoharie being about 40 per cent completed, while the other two are well under way, but none will be completed during the present working season. A contract for the construction of permanent warehouses at Albany and Whitehall has been let. Contracts for temporary wooden warehouses at Troy, Mechanicville, Fort Edward, Port Henry, Schenectady, Amsterdam, Fonda, Fort Plain, Little Falls, Ilion and Frankfort have been let during the year and most of the buildings are now

completed and in use for the benefit of shippers. Several of the buildings have been filled to their capacities with freight. With the increased number of boats using the canal, it will probably soon be found necessary to enlarge the sheds at Troy, Amsterdam and Little Falls and possibly others. A contract for paving the Albany terminal with granite has been completed. A contract for the erection of steel derricks on the Albany, Whitehall and Little Falls terminals has been let.

In the vicinity of New York city the recommendations of the Barge Canal Terminal Commission in their report of 1911 are being carried out. The harbor and bulkhead at Gowanus bay have been completed. Terminals at Greenpoint, Mott Haven and Pier 6, East river, are now under construction. Plans, specifications and estimates for several other terminals are under way.

#### SPECIAL SURVEYS

It has again been demonstrated that the customary appropriation of \$5,000 for making surveys for the various State departments having no engineering forces has been insufficient. An unusual number of requests for departmental surveys were made during the past fiscal year. The appropriation was exhausted early in the year, but fortunately funds could be provided by the departments themselves for carrying on the work. I would recommend that the sum of \$10,000 be appropriated to carry on the departmental surveys during the fiscal year July 1, 1918, to June 30, 1919.

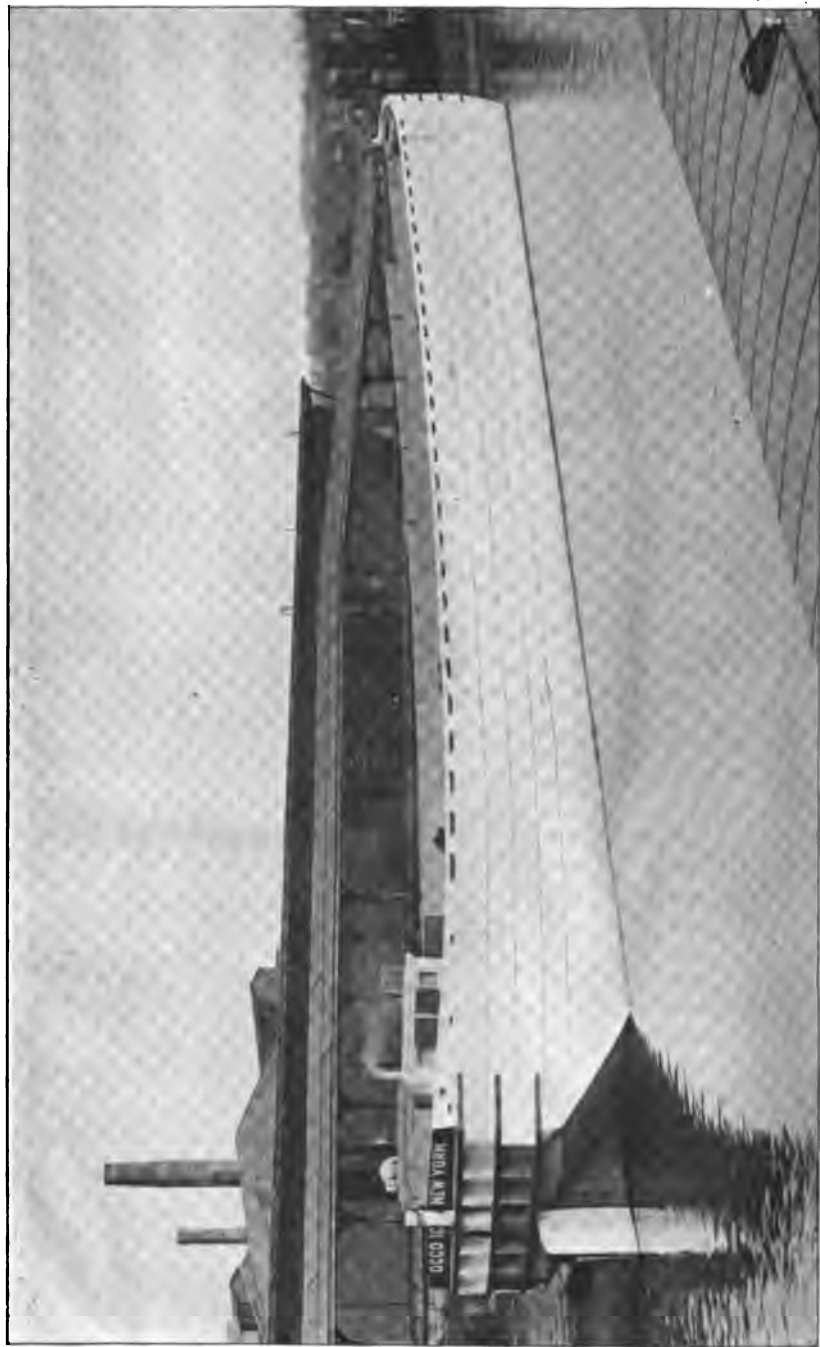
#### SPECIAL APPROPRIATIONS

##### *West Canada Creek Improvement*

The work of placing riprap protection on the embankments constructed by the State along the West Canada creek at Herkimer has been completed. The final estimate was \$5,927.00.

##### *Three-Mile Harbor*

A contract for dredging a channel in Three-Mile harbor was completed by the J. S. Packard Dredging Company at a cost of \$8,213.00.



A boat built for Barge canal traffic — built for an iron ore company for transporting ore from the Lake Champlain region.



2000

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*Rebuilding Fire Island State Park Dock*

A contract was let to Harry H. Tuthill on April 1, 1916, for the rebuilding of a dock at Fire Island State Park. Construction work was under the supervision of this Department. The final account was \$3,559.01.

## COURT OF CLAIMS

Numerous reports on the engineering features of claims filed against the State for alleged damages due to Barge canal construction and other reasons have been made. Very many of these reports are accompanied by maps made from surveys. In order that this work may be carried on in the future, ample funds should be available.

The detailed reports of the Senior Assistant Engineers who are in charge of the residencies, showing the status of both completed and pending contracts, follow.

The financial statements show disbursements made in connection with the work on this Division.

Respectfully submitted,

GEO. D. WILLIAMS,  
*Division Engineer.*

## APPENDED REPORTS — EASTERN DIVISION

## ERIE CANAL, RESIDENCY No. 1

Assistant Engineer R. D. Hayes reports:

This residency extends from Albany to the western end of the lower Mohawk aqueduct.

Work was completed previous to this year on the following contracts: Nos. 2, 2-A, 2-B, 2-C, 2-D, 2-E, 11, 34 and 114; terminal contracts Nos. 2 and 14, and those portions of Barge canal contracts Nos. 7, 14, 14-A, 14-B, 14-R, 16, 33, 91 and 92 that are within the limits of this residency.

Construction work has been done during the year on the following contracts: Nos. 2-G, 74, 91-A and 130; terminal contracts Nos. 2-P and 36, and the portions of terminal contracts Nos. 101, 201 and 203 in this residency.

Up to May 8, 1917, this residency was under the supervision of Senior Assistant Engineer E. V. R. Payne. Since then the writer has been in charge.

Following are detailed reports for each contract, together with a summary of quantities and percentages of work done during the year and up to the end of the fiscal year.

*Contract No. 130*

This contract was for improving the basin at the entrance of the Erie canal in the city of Albany. It was awarded to the Great Lakes Dredge & Dock Company, being signed on April 3, 1916. The engineer's preliminary estimate was \$9,000.00, and the contractor's bid, \$7,140.00.

The contract was accepted by the Canal Board and the final estimate of \$5,506.37 approved on October 11, 1916.

F. W. Harris, Assistant Engineer, was in charge.

Work was completed during the year.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	20,000	8,624	15,424	43.1	77.1
Gross estimate at contract prices.....	\$7,140 00	\$3,078 77	\$5,506 37	43.1	77.1

#### Contract No. 74

This contract is for excavating a channel in the Hudson river and the Mohawk river and performing work incidental thereto from Sta. 146 + 65 to Sta. 171 + 90. Length, 0.48 mile. It was awarded to Dunbar & Sullivan Dredging Company, being signed on February 13 1914. The engineer's preliminary estimate was \$256,372.00, the contractor's bid, \$240,872.00

F. W. Harris, Assistant Engineer, is in charge.

At the close of the fiscal year the prism had been excavated to the full depth and width except at the junction with contract No. 70-A.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	77,500	25,838	63,398	33.3	81.8
Sawed lumber, yellow pine....ft. B. M.	10,000	0	9,288	0.0	92.9
Second-class concrete.....cu. yds.	2,400	0	2,310	0.0	96.2
Iron castings, plain.....lbs.	1,900	0	1,837	0.0	96.7
Fender fastenings, complete in place, No.	215	0	222	0.0	103.3
Coffer-dams, pumping, bailing and draining.....lump sum	\$5,000	0	\$5,000	0.0	100.0
Gross estimate at contract prices.....	\$240,872 00	\$72,346 40	\$200,673 79	27.7	83.3

#### Contract No. 2-G

This contract is for constructing a spillway at Waterford side-cut, adjacent to Barge canal lock No. 2, and installing Taintor gate with operating equipment. It was awarded to A. A. Parker,

being signed on October 17, 1916. The engineer's preliminary estimate was \$9,686.00, and the contractor's bid, \$10,779.12. The contract price as modified by alterations Nos. 1 and 2 is \$11,769.85.

F. W. Harris, Assistant Engineer, is in charge.

The alterations on this contract are as follows:

Alteration No. 1, approved by the Canal Board March 1, 1917, provided for the placing of baffles in the lock floors and repointing of the old lock walls. It increased the contract price by \$265.00.

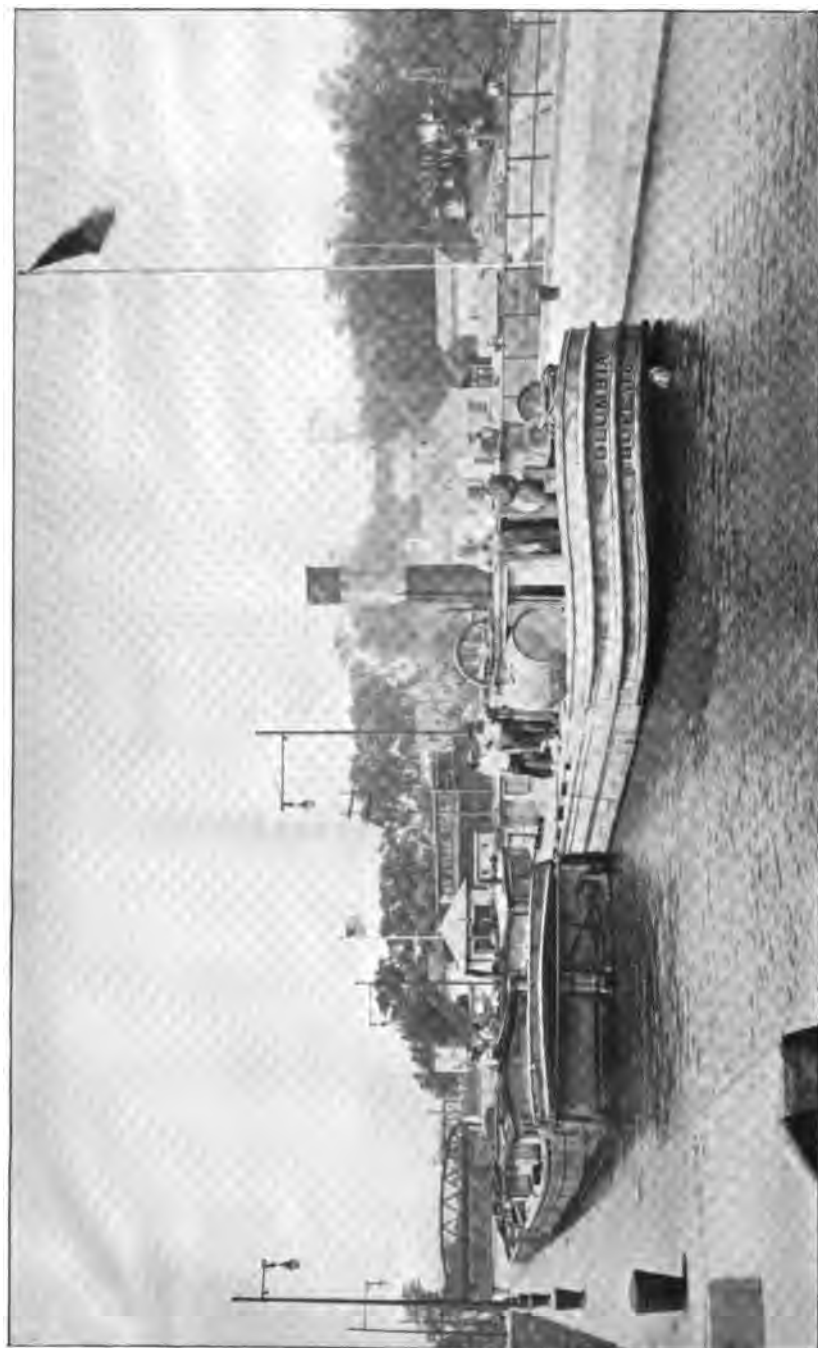
Alteration No. 2, approved by the Canal Board June 6, 1917, provided for the building of a bridge across the side-cut locks and a roadway to Barge canal lock No. 2. It increased the contract price by \$725.73.

The work contemplated under the original contract and under alteration No. 1 has been practically completed, and the concrete bridge under alteration No. 2 has been placed.

Work remaining to be done consists of building the roadway to Barge canal lock No. 2, provided for in alteration No. 2.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Total work done to date	Per cent of work done to date
Coffer-dams, pumping, bailing and draining.....	lump sum \$250	\$250	100.0
Excavation.....	cu. yds. 344	70	20.4
Removing existing masonry.....	cu. yds. 175	89.9	51.4
Forming embankment.....	cu. yds. 360	68	18.9
Sawed lumber, treated yellow pine.....	ft. B. M. 3,000	2,700	90.0
Piles.....	lin. ft. 350	325	92.9
Second-class concrete.....	cu. yds. 604	602.4	99.7
Reinforced concrete.....	cu. yds. 25	23.97	95.9
Relaying old masonry.....	cu. yds. 20	6.6	33.0
Structural steel.....	lbs. 26,280	27,746	105.6
Metal reinforcement.....	lbs. 1,620	1,624	100.2
Machinery.....	lbs. 7,200	7,091	98.5
Electrical equipment.....	lump sum \$1,500	\$1,350	90.0
Removing lock-gates and miter-sills.....	lump sum \$400	\$400	100.0
Repointing old masonry.....	lin. ft. 2,000	2,000	100.0
Drilling holes in old masonry.....	lin. ft. 25	23	112.0
Gross estimate at contract prices.....	\$11,769 85	\$11,260 81	95.8



A fleet of old-sized canal boats—one power boat and three barges—just beginning a trip to the west through the Barge canal; passing out of the first of the Waterford series of locks.

34

*Contract No. 91*

For building and equipping a hydro-electric power-plant on the Erie canal near the east end of Crescent dam. It was awarded to the Welles-Boughton Co., being signed on January 5, 1911, and was assigned to the Holington Co. on July 31, 1911. The engineer's preliminary estimate was \$44,600.00, and the contractor's bid, \$42,940.50. The contract price as modified by alteration No. 1 is \$44,985.50.

No work has been done during the year. The total work done to date amounts to \$43,715.78. For details of work done to date see Report of State Engineer for 1916, page 58.

*Contract No. 91-A*

This contract is for furnishing and installing new governor equipment for the hydro-electric power-plant at the east end of the Crescent dam. It was awarded to the Lord Construction Company, being signed on November 24, 1916. The engineer's preliminary estimate was \$6,310.00, and the contractor's bid, \$5,390.00.

F. W. Harris, Assistant Engineer, is in charge.

Extra work order dated April 16, 1917, provided for furnishing a transformer.

Installation was completed, except for final tests, on June 4, 1917.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
New governor equipment complete..... lump sum	\$5,700	\$5,120	90.0
Removing and storing old governor equipment..... lump sum	\$200	\$300	100.0
Painting concrete..... sq. yds.	100	87	87.0
Gross estimate at contract prices.....	\$6,930 00	\$5,356 10	90.3
<i>Extra Work Order</i>			
April 16, 1917..... lump sum	\$300 00	.....	.....



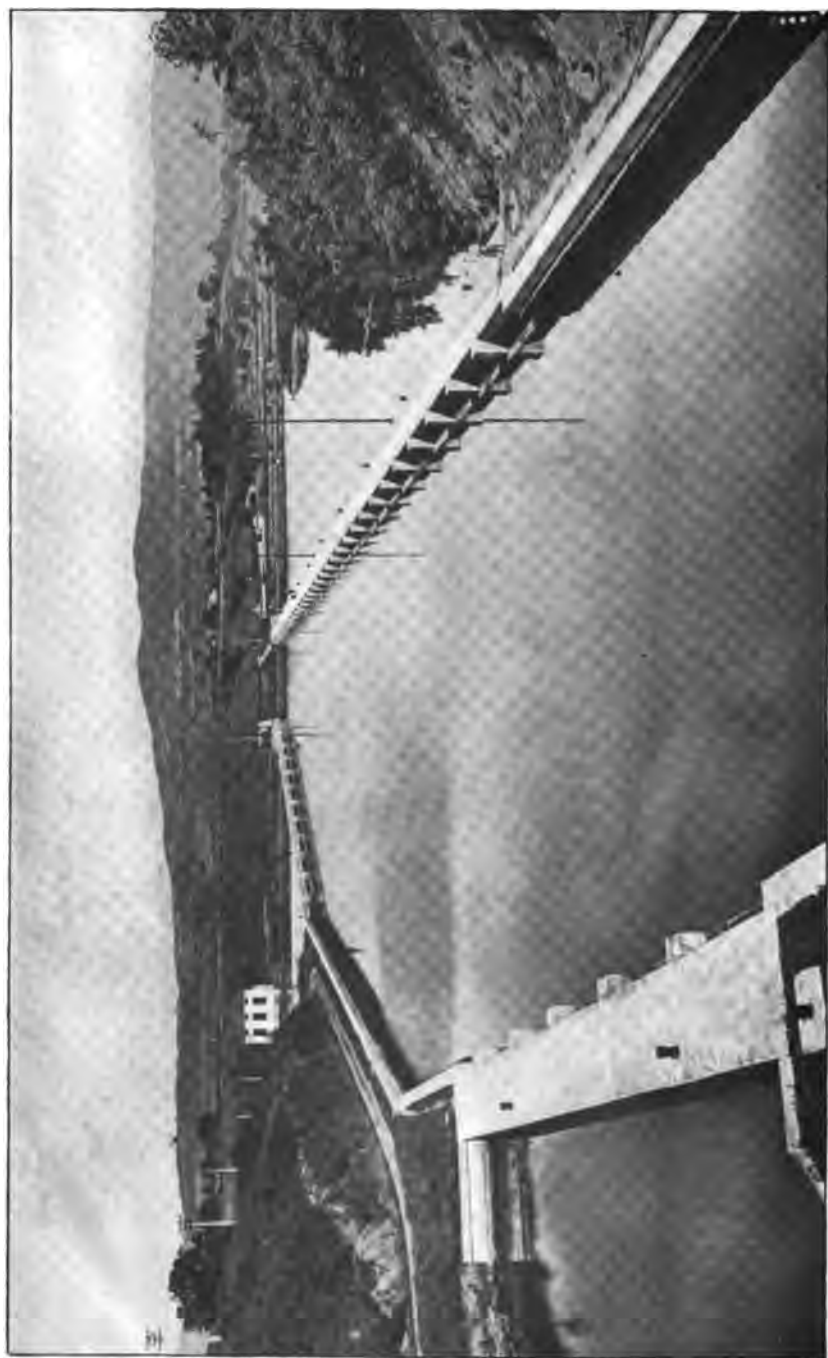
*Construction Work—Barge Canal*

The Barge canal work done on section 1 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						
	Contract No. 2	Contract No. 2-E	Contract No. 2-G	Contract No. 7 (section 1)	Contract No. 11	Contract No. 14 (section 1)	Contract No. 14-A (section 1)
1905.....	\$36,640						
1906.....	135,360				\$5,500		
1907.....	146,770			\$7,930	150,190		
1908.....	302,580			6,310	296,580	\$68,040	
1909.....	68,338			24	269,610	279,610	
1910.....		\$137,560			253,950	85,420	
1911.....		91,110			154,540	12,140	
1912.....		45,940			60,070	660	26
1913.....		4,574			27,793	2,249	\$360
1914.....							
1915.....							
1916.....							
1917.....			\$11,260				
Totals...	\$689,688	\$279,184	\$11,260	\$14,264	\$1,218,233	\$448,119	\$386
<i>Extra Work Orders Paid, 1905-1917, Inclusive</i>							
1906.....	\$1,316						
1908.....	1,713						
1909.....	32,913			\$27			
1910.....					\$1,500		
1911.....		\$6,006			898		
1912.....		802				\$1,904	
1913.....		143			691		
1915.....							
Totals...	\$35,942	\$6,951		\$27	\$3,089	\$1,904	

YEAR*	VALUE OF WORK DONE						
	Contract No. 14-B (section 1)	Contract No. 14-R (section 1)	Contract No. 16 (section 1)	Contract No. 33 (section 1)	Contract No. 34	Contract No. 74	Contract No. 91
1905.....							
1906.....							
1907.....					\$13,090		
1908.....					7,430		
1909.....					1,738		
1910.....							
1911.....				\$133,230			\$1,740
1912.....		\$498	\$3,569	4,537			18,340
1913.....							18,760
1914.....						\$8,730	4,060
1915.....	\$52,280					19,500	810
1916.....	14,636					146,930	
1917.....						25,510	
Totals...	\$66,916	\$498	\$3,569	\$137,767	\$22,258	\$200,670	\$43,710
<i>Extra Work Orders Paid, 1905-1917, Inclusive</i>							
1906.....							
1908.....							
1909.....					\$59		
1910.....							
1911.....				\$1,372			
1912.....				3,965			
1913.....							
1915.....							
Totals...				\$5,337	\$59		



A view from the uppermost of the Waterford series of five locks, showing the two locks next below and one of the pools between the locks, with the channel lined by concrete docking.



YEAR*	VALUE OF WORK DONE				
	Contract No. 91-A	Contract No. 92 (section 1)	Contract No. 114	Contract No. 130	Totals
1905.....	.....	.....	.....	.....	\$36,640
1906.....	.....	.....	.....	.....	140,860
1907.....	.....	.....	.....	.....	317,980
1908.....	.....	.....	.....	.....	680,940
1909.....	.....	.....	.....	.....	619,320
1910.....	.....	.....	.....	.....	476,930
1911.....	.....	.....	.....	.....	392,760
1912.....	.....	.....	.....	.....	133,614
1913.....	.....	\$14,620	.....	.....	68,356
1914.....	.....	145,860	\$17,690	.....	176,366
1915.....	.....	45,380	19,070	.....	137,040
1916.....	.....	841	98	\$2,420	164,925
1917.....	\$5,350	.....	.....	3,086	45,2.6
Totals.....	\$5,350	\$206,701	\$36,858	\$5,506	\$3,390,937

Extra Work Orders Paid, 1905-1917, Inclusive					
1906.....	.....	.....	.....	.....	\$1,316
1908.....	.....	.....	.....	.....	1,713
1909.....	.....	.....	.....	.....	32,999
1910.....	.....	.....	.....	.....	1,503
1911.....	.....	.....	.....	.....	8,276
1912.....	.....	.....	.....	.....	6,671
1913.....	.....	.....	.....	.....	834
1915.....	.....	\$158	\$50	.....	208
Totals.....	.....	\$158	\$50	.....	\$53,517

\* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1905, 1907, 1914, 1916 and 1917. The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 7, sections 5, 7 and 9, Erie canal, and section 2, Champlain; contract No. 14, sections 2 and 3, Erie; contracts Nos. 14-A, 14-B and 14-R, section 2, Erie; contract No. 16, sections 2 and 3, Champlain; contract No. 33, section 3, Champlain, and section 1, Oswego; contract No. 92, sections 2, 3 and 4, Erie, and sections 1 and 2, Champlain.

### Terminal Contract No. 2-P—Albany

This contract was for paving the terminal at Albany. It was awarded to Patrick W. Mulderry, being signed on November 12, 1915. Work began in April, 1916. The engineer's preliminary estimate was \$42,869.00, the contractor's bid, \$33,704.90. The contract price as modified by alteration No. 1 was \$32,072.90.

The contract was accepted by the Canal Board and the final estimate of \$30,496.70 approved on August 31, 1916.

F. W. Harris, Assistant Engineer, was in charge.

Alteration No. 1, approved by the Canal Board May 31, 1916, provided for omitting pavement at the site of the proposed ware-

house and for the construction of a small retaining wall at the north end of the dock. This alteration decreased the amount of the contract by \$1,632.00.

Extra work order dated June 26, 1916, provided for the removal of curbing at the site of the proposed warehouse. Payment amounted to \$48.50, on a lump sum basis.

Work under the extra work order was completed on August 9, 1916.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	3,706	0	3,288	0.0	88.7
Stone-block pavement.....sq. yds.	10,500	2,293	10,053	21.8	95.7
Concrete curb.....lin. ft.	2,105	301	2,006	14.3	95.3
Drain.....lin. ft.	6,615	275	6,091	4.2	92.1
Second-class concrete.....cu. yds.	9	8.3	8.3	92.2	92.2
Gross estimate at contract prices.....	\$32,072 90	\$6,244 70	\$30,496 70	19.5	95.1
<i>Extra Work Order</i>					
June 26, 1916.....lump sum	\$48 50	.....	\$48 50	.....	Finished

### *Terminal Contract No. 201*

This contract provides for constructing terminal warehouses at Albany and Whitehall. It was awarded to J. A. Laporte, being signed on January 2, 1917. The engineer's preliminary estimate for the Albany warehouse was \$36,500.00, and the contractor's bid, \$40,106.50.

W. L. Caler, Assistant Engineer, is in charge at Albany.

Excavating for the foundation of the Albany warehouse began April 3, 1917. A labor strike occurred on April 30 and operations were not resumed until June 1.

Two hundred and fifty feet of vitrified pipe have been laid and the footing courses of the inshore wall and four blocks of the out-shore have been concreted.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Albany</i>			
Excavation.....	cu. yds. 2,900	1,599	55.1
Wooden fence.....	lin. ft. 530	0	0.0
Second-class concrete.....	cu. yds. 380	64	16.8
Reinforced concrete.....	cu. yds. 25	0	0.0
12-in. vitrified pipe.....	lin. ft. 700	400	57.1
Structural steel.....	lbs. 124,900	0	0.0
Iron castings.....	lbs. 1,000	0	0.0
Metal reinforcement.....	lbs. 2,000	0	0.0
Wrought-iron pipe railing.....	lin. ft. 12	0	0.0
Painting walls and ceiling.....	sq. yds. 1,730	0	0.0
8-in. terra cotta tile.....	sq. ft. 7,300	0	0.0
4-in. terra cotta tile.....	sq. ft. 2,800	0	0.0
Exterior stucco.....	sq. yds. 570	0	0.0
Interior plaster.....	sq. yds. 886	0	0.0
Mastic flooring.....	sq. ft. 6,640	0	0.0
Steel stairs.....	lump sum \$402	0	0.0
Steel railing.....	lump sum \$300	0	0.0
Wooden railing.....	lump sum \$15	0	0.0
Hollow metal windows.....	No. 17	0	0.0
Solid metal windows.....	No. 25	0	0.0
Hollow metal entrance and vestibule doors.....	No. 4	0	0.0
Hollow metal repair room doors.....	No. 2	0	0.0
Hollow metal interior doors.....	No. 15	0	0.0
Vault doors.....	No. 2	0	0.0
Warehouse doors.....	No. 10	0	0.0
Metal trim.....	lin. ft. 640	0	0.0
Cement roofing tile.....	squares 108	0	0.0
Terra cotta roofing tile.....	squares 1.2	0	0.0
Cornice.....	lin. ft. 560	0	0.0
Gutters.....	lin. ft. 560	0	0.0
Conductors.....	lin. ft. 285	0	0.0
Steel ceilings.....	sq. ft. 90	0	0.0
Plumbing system.....	lump sum \$980	0	0.0
Heating system.....	lump sum \$1,800	0	0.0
Electric system.....	lump sum \$1,620	0	0.0
Lockers.....	lump sum \$75	0	0.0
Automatic sprinkler system.....	lump sum \$1,870	0	0.0
Total for Albany.....	\$40,106 50	\$2,130 54	5.3
<i>Warehouse at Whitehall</i>			
Excavation.....	cu. yds. 1,850	680	36.8
Wooden fence.....	lin. ft. 368	0	0.0
Second-class concrete.....	cu. yds. 224	0	0.0
Reinforced concrete.....	cu. yds. 14	0	0.0
12-in. vitrified pipe.....	lin. ft. 140	0	0.0
Structural steel.....	lbs. 79,500	0	0.0
Iron castings.....	lbs. 850	0	0.0
Metal reinforcement.....	lbs. 1,340	0	0.0
Painting walls and ceilings.....	sq. yds. 1,130	0	0.0
8-in. terra cotta tile.....	sq. ft. 4,500	0	0.0
4-in. terra cotta tile.....	sq. ft. 1,950	0	0.0
Exterior stucco.....	sq. yds. 350	0	0.0
Interior plaster.....	sq. yds. 640	0	0.0
Mastic flooring.....	sq. ft. 3,670	0	0.0
Steel stairs.....	lump sum \$402	0	0.0
Steel railing.....	lump sum \$300	0	0.0
Hollow metal windows.....	No. 13	0	0.0
Solid metal windows.....	No. 10	0	0.0
Hollow metal entrance and vestibule doors.....	No. 4	0	0.0
Hollow metal interior doors.....	No. 12	0	0.0
Vault doors.....	No. 2	0	0.0
Warehouse doors.....	No. 4	0	0.0
Metal trim.....	lin. ft. 452	0	0.0
Cement roofing tile.....	squares 62	0	0.0
Terra cotta roofing tile.....	squares 1.2	0	0.0
Cornice.....	lin. ft. 360	0	0.0

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Whitehall — (Continued)</i>			
Gutters.....lin. ft.	360	0	0.0
Conductors.....lin. ft.	160	0	0.0
Steel ceilings.....sq. ft.	90	0	0.0
Plumbing system.....lump sum	\$1,164	0	0.0
Heating system.....lump sum	\$1,320	0	0.0
Electric system.....lump sum	\$720	0	0.0
Lockers.....lump sum	\$72	0	0.0
Automatic sprinkler system.....lump sum	\$1,450	0	0.0
Total for Whitehall.....	\$25,068 35	\$408 00	1.6
<i>Summary of contract</i>			
Total for Albany.....	\$40,106 50	\$2,130 54	5.3
Total for Whitehall.....	25,068 35	408 00	1.6
Gross estimate at contract prices.....	\$65,174 85	\$2,538 54	3.6

#### *Terminal Contract No. 101*

This contract provides for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, being signed on December 18, 1916, and was assigned to the Mohawk Dredge & Dock Co., Inc., on March 26, 1917. The engineer's preliminary estimate for the derrick at Albany was \$3,771.70, and the contractor's bid, \$5,394.20.

No construction work has been done at Albany as yet.

#### *Terminal Contract No. 203*

This contract was for constructing temporary terminal warehouses at Troy, Mechanicville, Fort Edward and Port Henry. It was let to Collins Bros., of Mechanicville, N. Y., the contract being signed on December 29, 1916. Work was started at Troy in January, 1917, and finished the latter part of the next month. The engineer's preliminary estimate for the Troy warehouse was \$1,160.00, and the contractor's bid, \$1,011.65.

The original contract work was accepted by the Canal Board May 10, 1917, and the final estimate approved June 6, 1917. The amount paid on the Troy warehouse was \$977.99.

H. L. Clarke, Assistant Engineer, was in charge.



BARGE CANAL, TERMINAL CONTRACTS NOS. 14 AND 203 — TROY

Use of the Troy terminal in transferring between rail and boat lines. For traffic with interior New England points this terminal is a convenient transfer station.





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Extra work order dated April 20, 1917, provided for moving the warehouse at Troy erected under the original contract and building a new warehouse adjoining it.

Operations under the extra work order were begun April 26, 1917, under the supervision of F. W. Harris, Assistant Engineer, and finished June 27.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
<i>Warehouse at Troy</i>			
Excavation..... cu. yds.	90	46	51.1
Forming embankment..... cu. yds.	45	30	66.7
Second-class concrete..... cu. yds.	6	5.6	93.3
Iron and steel fastenings..... lbs.	165	88	53.3
Painting..... lump sum	\$60	\$60	100.0
Carpenter work..... lump sum	\$738 95	\$738 95	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Troy.....	\$1,011 65	\$977 99	96.7
<i>Warehouse at Mechanicville</i>			
Excavation..... cu. yds.	60	25	41.7
Forming embankment..... cu. yds.	30	15	50.0
Second-class concrete..... cu. yds.	4	2.4	60.0
Iron and steel fastenings..... lbs.	110	59	53.6
Painting..... lump sum	\$40	\$40	100.0
Carpenter work..... lump sum	\$581 30	\$581 30	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Mechanicville.....	\$746 10	\$707 02	94.8
<i>Warehouse at Fort Edward</i>			
Excavation..... cu. yds.	60	3	5.0
Forming embankment..... cu. yds.	30	0	0.0
Second-class concrete..... cu. yds.	4	3.1	77.5
Iron and steel fastenings..... lbs.	110	59	53.6
Painting..... lump sum	\$40	\$40	100.0
Carpenter work..... lump sum	\$581 30	\$581 30	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Fort Edward.....	\$740 70	\$701 25	94.7
<i>Warehouse at Port Henry</i>			
Excavation..... cu. yds.	60	3	5.0
Forming embankment..... cu. yds.	30	0	0.0
Second-class concrete..... cu. yds.	4	3.7	92.5
Iron and steel fastenings..... lbs.	110	59	53.6
Painting..... lump sum	\$40	\$40	100.0
Carpenter work..... lump sum	\$581 30	\$581 30	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Port Henry.....	\$746 10	\$707 52	94.8
<i>Summary of contract</i>			
Total for Troy.....	\$1,011 65	\$977 99	96.7
Total for Mechanicville.....	746 10	707 02	94.8
Total for Fort Edward.....	740 70	701 25	94.7
Total for Port Henry.....	746 10	707 52	94.8
Gross estimate at contract prices.....	\$3,244 55	\$3,093 78	95.4
<i>Extra Work Order</i>			
April 20, 1917..... cost plus 15 per cent		\$1,621 14	

*Terminal Contract No. 36 — Cohoes*

This contract is for constructing a terminal at Cohoes. It was awarded to the Troy Public Works Company, being signed on March 27, 1917. The engineer's preliminary estimate was \$61,000.00, and the contractor's bid, \$57,600.00.

F. W. Harris, Assistant Engineer, is in charge.

A plant has been brought to the site of the work and erected. One 60-foot section of coffer-dam is in place, ready for pumping.

*Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 1 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE					Totals
	Contract No. 2	Contract No. 2-P	Contract No. 14	Contract No. 201 (section 1)	Contract No. 203 (section 1)	
1913.....	\$74,390	.....	.....	.....	.....	\$74,390
1914.....	66,095	.....	\$46,010	.....	.....	112,105
1915.....	.....	.....	79,327	.....	.....	79,327
1916.....	.....	\$24,250	.....	.....	.....	24,250
1917.....	.....	6,247	.....	\$2,130	\$978	9,355
Totals.....	\$140,475	\$30,497	\$125,337	\$2,130	\$978	\$299,417
<i>Extra Work Orders Paid, 1913-1917, Inclusive</i>						
1917.....	.....	\$48	.....	.....	\$1,624	\$1,672
Totals.....	.....	\$48	.....	.....	\$1,624	\$1,672

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on the contracts of this section during 1913, 1914, 1915 and 1916.

The other sections on which work has been done under certain of the above terminal contracts are as follows: Contract No. 201, section 3, Champlain; contract No. 203, sections 1, 2 and 3, Champlain.

## ERIE CANAL, RESIDENCY NO. 2

Senior Assistant Engineer D. C. Wedgeworth reports:

Residency No. 2 extends from Crescent dam at the head of what is known as the Waterford flight of locks to the old lock No. 27, above Cranesville, a distance of 33 miles. Within these limits, however, the work of dredging, strengthening movable dams and some other details are under the supervision of the Mohawk River residency and Erie canal Residency No. 3.

The contracts under which work has been done during the year covered by this report are Nos. 129, 145, 150 and 155, terminal contract No. 204, and Forts Ferry highway improvement.

*Contract No. 150*

This contract is for the construction of a concrete apron below the head-gates of Vischer Ferry dam. It was let to the Brown & Lowe Company, the contract being signed on December 1, 1916. Work was begun December 6, 1916. The engineer's preliminary estimate was \$20,300.00, the contractor's bid, \$21,780.00.

In order to prevent scour and the undercutting of the foundation of the main structure of the dam, it was found necessary, before opening the head-gates, to protect the rock immediately below the gates by a concrete apron. This contract was for the placing of this concrete.

J. C. Bell, Assistant Engineer, is in charge.

Assembling of plant and hauling material for concrete began December 6, 1916. Cofferdams were placed during December and attempts made to unwater the site of the work. Later a strip along the lower end of the apron was coffer-dammed and concreted, thus forming a concrete coffer-dam for the entire work. The weather was very severe. In February the high water stopped the work for a time, but it was begun again on March 3. On March 24 the site was flooded again and work was discontinued until May 10. On June 12 an unusual flood overtopped the coffer-dam and flooded work with several feet of water. On June 18 work was again begun and on July 10 the apron was completed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	3,000	1,940	64.7
Second-class concrete.....cu. yds.	2,000	1,983	99.1
Coffer-dams, pumping, bailing and draining.....lump sum	\$2,500	\$2,500	100.0
Gross estimate at contract prices.....	\$21,780 00	\$20,995 42	96.4

*Contract No. 155*

This contract is for furnishing and installing seven hoists for the operation of the bulkhead gates in the north end of Vischer Ferry dam. It was let to Lupfer & Remick of Buffalo, N. Y., being signed on January 31, 1917. Work was begun on February 28, 1917. The engineer's preliminary estimate was \$9,998.00, and the contractor's bid, \$11,586.00.

J. C. Bell, Assistant Engineer, is in charge.

Work began on this contract on February 28, holes for anchor bolts being drilled in masonry at the head-gates. On May 8 the first gate-hoists were delivered and the last on June 23. Temporary hoists for removing the gates for cleaning and painting are being installed as the year ends.

The following table shows the contract quantities and work done, with percentages:

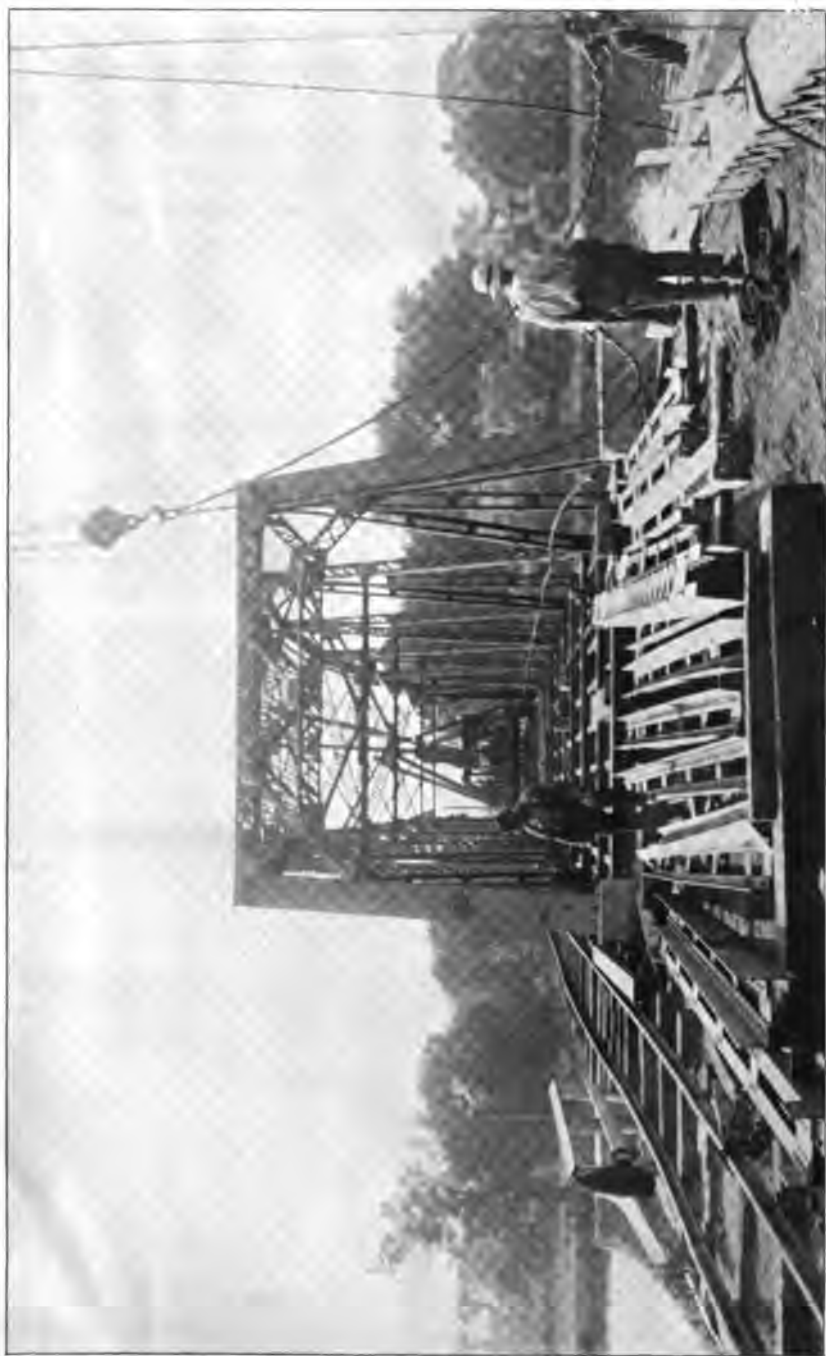
ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Bulkhead hoists, complete.....No.	7	3	42.9
Cast steel racks.....lbs	11,950	0	0.0
Structural steel.....lbs	5,900	0	0.0
Removing and storing old racks and plates.....lump sum	\$200	0	0.0
Cleaning and painting bulkhead gates.....No.	7	0	0.0
Raising gates 14 feet from sill.....No.	5	0	0.0
Straightening bent stems.....No.	3	0	0.0
Gross estimate at contract prices.....	\$11,586 00	\$2,850 00	24.6

*Contract No. 129*

This contract is for the construction of the substructure, superstructure and approaches of Freeman's bridge over the Mohawk river near Schenectady at about Barge canal center line Sta. 1198+93. It was let to The Foundation Company of New York city, being signed on June 6, 1916. Work was begun June 14, 1916. The engineer's preliminary estimate was \$80,976.50. The contractor's bid was \$87,390.80.

J. C. Bell, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board October 18, 1916, provides for protecting the slopes of the approaches with riprap taken from the abutments of the old bridge and a near-by



BARRE CANAL, CONTRACT No. 129  
Freeman's bridge — crossing the canalized Mohawk river a little below Schenectady. This bridge replaces a structure washed out by a flood in 1914.



bridge over the Erie canal. This will increase the estimate by 360 cubic yards, or \$1,080.00, the price of riprap being \$3.00 per cubic yard.

Work on this contract was commenced on June 14, 1916, by excavation for the south abutment. Although not required by the plans it was thought best to try to drive piles for the abutment. No penetration could be obtained, however, and the pile-driving was discontinued.

Work was begun in excavating for the north abutment on August 3, 1916. Work on the pier was begun on September 1, 1916. It was found impossible to drive piles under the north abutment, as called for, and they were eliminated.

Work progressed rapidly, excavation for the pier being made with a clam-shell bucket inside the steel piling coffer-dam. A seal of concrete was deposited before the coffer-dam was unwatered. All concrete work was finished by the close of navigation. Approaches were nearly completed and the work was left until steel could be delivered.

The first carload of steel arrived June 2, 1917, but erection was not begun until one whole span arrived. June 30, 1917, found the erection of the south span well under way.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent done of work to date
Excavation.....cu. yds.	9,540	8,031	8,828	84.2	92.5
Lining.....cu. yds.	329	22	22	6.7	6.7
Concrete in pier below elevation 199.....cu. yds.	533	433	433	81.2	81.2
Second-class concrete.....cu. yds.	2,010	1,984	1,989	98.7	99.0
Sawed lumber.....ft. B. M.	66,500	0	0	0.0	0.0
Wooden sheet-piling.....ft. B. M.	17,000	0	0	0.0	0.0
Foundation piles.....lin. ft.	3,390	90	90	2.7	2.7
Wooden fence.....lin. ft.	790	738	738	93.4	93.4
Lattice railing.....lin. ft.	474	0	0	0.0	0.0
Structural steel.....lbs.	783,000	3,838	3,838	0.5	0.5
Cast-iron pipe.....lbs.	13,100	0	14,647	0.0	111.8
Oil signal-lamps.....No.	10	0	0	0.0	0.0
Removing existing buildings.....lump sum	\$1	\$1	\$1	100.0	100.0
Maintaining navigation.....lump sum	\$1	0	0	0.0	0.0
Riprap.....cu. yds.	360	315	315	87.5	87.5
Deduct for riprap stone found on same side of river as used.....cu. yds.		315	315		
Gross estimate at contract prices.....	\$38,470 80	\$34,452 78	\$35,340 19	38.9	39.8



*Contract No. 145*

This contract was for raising the bridge across the Mohawk river at Schenectady. It was let to the Horseheads Construction Company, the contract being signed on January 4, 1917. Work was begun on April 14, 1917. The engineer's preliminary estimate was \$5,092.00, the contractor's bid \$3,978.00.

J. C. Bell, Assistant Engineer, was in charge.

Work was begun April 14, 1917 and progressed rapidly. Each span was raised and steel chairs placed under the bridge shoes and a concrete backwall carrying supports for floor stringers placed, traffic being maintained as usual. This was done by raising the ends of adjacent spans at the same time.

Work was finished May 18, 1917, and the completed work was accepted June 6, 1917.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
First-class concrete.....cu. yds.	41	81.6	77.0
Sawed lumber.....ft. B. M.	4,900	2,163	54.1
Structural steel.....lbs.	7,100	7,965	101.2
Metal reinforcement.....lbs.	800	810	101.2
Drilling holes in existing masonry.....lin. ft.	120	79	65.8
Pointing old masonry.....lin. ft.	250	150	60.0
Raising bridge.....jump sum	\$2,500	\$2,500	100.0
Maintaining highway traffic.....jump sum	\$200	\$200	100.0
Gross estimate at contract prices.....	\$3,978 00	\$3,765 08	94.6



BARGE CANAL, CONTRACT NO. 8-A

Lock and movable dam at Scotia as they appear during the navigation season.

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*Construction Work—Barge Canal*

The Barge canal work done on section 2 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						
	Contract No. 8	Contract No. 8-A	Contract No. 14 (section 2)	Contract No. 14-A (section 2)	Contract No. 14-B (section 2)	Contract No. 14-R (section 2)	Contract No. 20-D (section 2)
1907.....	\$114,940						
1908.....	220,750		\$199,530				
1909.....	816,870		241,660				
1910.....	171,990		214,600				
1911.....	95,870		167,660				\$2,620
1912.....			81,150			\$131	25,060
1913.....		\$290,860	56,950	\$3,200			349,800
1914.....		433,310	3,594	424			404,760
1915.....		233,533			\$16,300		400,810
1916.....					4,953		273,100
1917.....							231,766
Totals...	\$920,420	\$957,703	\$1,065,174	\$3,624	\$21,253	\$131	\$1,687,936

*Extra Work Orders Paid, 1907-1917, Inclusive*

1908.....			\$1,775				
1910.....	\$356		511				
1912.....			13,597				
1913.....		\$1,452	34,677				\$32,827
1914.....							10,064
1915.....		8,455					
1916.....							3,037
1917.....							2,203
Totals...	\$356	\$9,907	\$50,560				\$48,131

YEAR*	VALUE OF WORK DONE						
	Contract No. 20-D, special agreement (section 2)	Contract No. 36 (section 2)	Contract No. 92 (section 2)	Contract No. 109	Contract No. 115	Contract No. 119	Contract No. 120 (section 2)
1907.....							
1908.....							
1909.....							
1910.....							
1911.....		\$17,550					
1912.....							
1913.....			\$70				
1914.....			68,810	\$14,760		\$26,730	
1915.....			182,720	136,611	\$91,790	23,837	\$50,260
1916.....			4,904		5,199		18,220
1917.....	\$13,780						852
Totals...	\$13,780	\$17,550	\$206,504	\$151,371	\$96,989	\$50,567	\$79,332

*Extra Work Orders Paid, 1907-1917, Inclusive*

1908.....							
1910.....							
1912.....		\$410					
1913.....							
1914.....							
1915.....			\$1,602				
1916.....					\$53		
1917.....							\$70
Totals...		\$410	\$1,602		\$53		\$70

YEAR*	VALUE OF WORK DONE					Totals
	Contract No. 125	Contract No. 129	Contract No. 145	Contract No. 150	Contract No. 155	
1907.....						\$114,940
1908.....						420,280
1909.....						658,530
1910.....						386,590
1911.....						283,700
1912.....						106,341
1913.....						700,910
1914.....	\$4,920					957,308
1915.....	33,775					1,129,638
1916.....		\$880				307,256
1917.....		34,490	\$3,765	\$20,990	\$2,850	308,483
Totals.....	\$38,695	\$35,340	\$3,765	\$20,990	\$2,850	\$5,373,974
<i>Extra Work Orders Paid, 1907-1917, Inclusive</i>						
1908.....						\$1,775
1910.....						867
1912.....						14,007
1913.....						68,956
1914.....						10,064
1915.....	\$105					10,162
1916.....	378					3,468
1917.....						2,273
Totals.....	\$483					\$111,572

\* The years 1907 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1907, 1909 and 1911.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 14, sections 1 and 3, Erie canal; contracts Nos. 14-A, 14-B and 14-R, section 1, Erie; contracts Nos. 20-D and 36, section 3, Erie; contract No. 92, sections 1, 3 and 4 Erie, and sections 1 and 2, Champlain; contract No. 120, section 3, Erie.

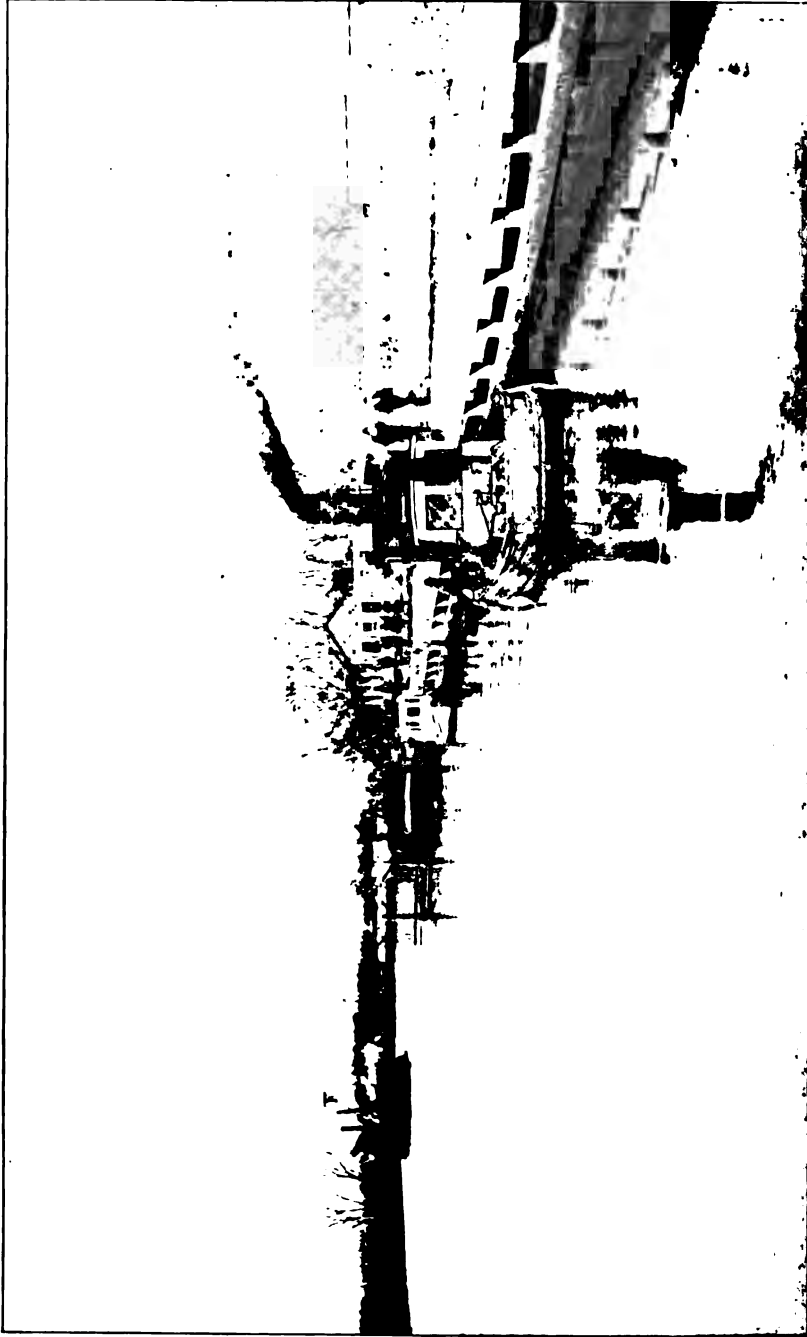
#### *Terminal Contract No. 204*

This contract is for constructing temporary warehouses at Schenectady, Amsterdam, Fonda, Ilion and Frankfort. It was let to Byron, Forman and Riggs, Inc., of Cohoes, being signed on March 12, 1917, and was assigned to Kennedy and Scullen on April 23, 1917, the assignment being approved by the Superintendent of Public Works on May 2, 1917. Work at Schenectady was started by Kennedy and Scullen on April 19. The engineer's preliminary estimate for the Schenectady warehouse, on this section, was \$1,160.00, and the contractor's bid, \$1,058.35. The contractor's bid for this warehouse as modified by alteration No. 1 was \$4,037.60.

R. B. Smith, is the engineer in charge.

Alteration No. 1, approved by the Canal Board April 12, 1917, provides for increasing the size of the warehouses. It increases the contract price by \$14,671.60.

Construction was delayed somewhat by the difficulty of obtaining lumber, but this warehouse has been turned over for use, although the lighting system is not complete.



BARGE CANAL, TERMINAL CONTRACTS NOS. 8 AND 204—SCHENECTADY

General view of the terminal. A spur channel and a harbor were dredged in the Binne kill and a terminal area was formed by filling with spoil.



The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
<i>Warehouse at Schenectady</i>			
Excavation.....cu. yds.	22	21	95.5
Forming embankment.....cu. yds.	5	0	0.0
Second-class concrete.....cu. yds.	28	28	100.0
Iron and steel fastenings.....lbs.	210	210	100.0
Painting, alteration No. 1.....lump sum	\$156	\$156	100.0
Carpenter work, alteration No. 1.....lump sum	\$3,369 20	\$3,369 20	100.0
Electric work, alteration No. 1.....lump sum	\$160	\$136	85.0
Total for Schenectady.....	\$4,037 60	\$4,012 60	99.4
<i>Warehouse at Amsterdam</i>			
Excavation.....cu. yds.	33	34	103.0
Forming embankment.....cu. yds.	5	0	0.0
Second-class concrete.....cu. yds.	56	54	96.4
Iron and steel fastenings.....lbs.	*400	390	97.5
Painting, alteration No. 1.....lump sum	\$200	\$200	100.0
Carpenter work, alteration No. 1.....lump sum	\$4,879 20	\$4,879 20	100.0
Electric work, alteration No. 1.....lump sum	\$290	\$170	85.0
Total for Amsterdam.....	*\$5,976 20	\$5,922 30	99.1
<i>Warehouse at Fonda</i>			
Excavation.....cu. yds.	22	22	100.0
Forming embankment.....cu. yds.	5	0	0.0
Second-class concrete.....cu. yds.	28	28	100.0
Iron and steel fastenings.....lbs.	*270	260	96.3
Painting, alteration No. 1.....lump sum	\$156	\$156	100.0
Carpenter work, alteration No. 1.....lump sum	\$3,369 20	\$3,369 20	100.0
Electric work, alteration No. 1.....lump sum	\$160	0	0.0
Total for Fonda.....	*\$4,043 00	\$3,881 60	96.0
<i>Warehouse at Ilion</i>			
Excavation.....cu. yds.	14	14	100.0
Forming embankment.....cu. yds.	5	0	0.0
Second-class concrete.....cu. yds.	18	18	100.0
Iron and steel fastenings.....lbs.	130	145	111.5
Painting, alteration No. 1.....lump sum	\$125	\$125	100.0
Carpenter work, alteration No. 1.....lump sum	\$1,986 70	\$1,986 70	100.0
Electric work, alteration No. 1.....lump sum	\$140	0	0.0
Total for Ilion.....	\$2,477 90	\$2,338 75	94.4
<i>Warehouse at Frankfort</i>			
Excavation.....cu. yds.	14	14	100.0
Forming embankment.....cu. yds.	5	0	0.0
Second-class concrete.....cu. yds.	18	18	100.0
Iron and steel fastenings.....lbs.	130	145	111.5
Painting, alteration No. 1.....lump sum	\$125	\$125	100.0
Carpenter work, alteration No. 1.....lump sum	\$1,986 70	\$1,986 70	100.0
Electric work, alteration No. 1.....lump sum	\$140	0	0.0
Total for Frankfort.....	\$2,477 90	\$2,338 75	94.4
<i>Summary of contract</i>			
Warehouse at Schenectady.....	\$4,037 60	\$4,012 60	99.4
Warehouse at Amsterdam.....	*5,976 20	5,922 30	99.1
Warehouse at Fonda.....	*4,043 00	3,881 60	96.0
Warehouse at Ilion.....	2,477 90	2,338 75	94.4
Warehouse at Frankfort.....	2,477 90	2,338 75	94.4
Gross estimate at contract prices.....	*\$19,012 60	\$18,494 00	97.3

\* Figures given include excess quantities authorized by the Canal Board, as follows:  
 Iron and steel fastenings at Amsterdam, 80 lbs., by resolution dated May 10, 1917.  
 Iron and steel fastenings at F. n.s., 60 lbs., by resolution dated May 10, 1917.  
 These quantities at the contract prices amount to \$12.60.



*Construction Work — Barge Canal Terminals.*

The Barge canal terminal work done on section 2 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE			
	Contract No. 8	Contract No. 35	Contract No. 204 (section 2)	Totals
1913.....	\$17,910	.....	.....	\$17,910
1914.....	78,970	.....	.....	78,970
1915.....	62,866	\$9,146	.....	72,012
1917.....	.....	.....	\$4,010	4,010
Totals.....	\$157,746	\$9,146	\$4,010	\$170,902

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.  
 Note.—No extra work orders have been paid on this section. No work was done during 1916. Under terminal contract No. 204, work has also been done on sections 3 and 4, Erie canal.

*Glenville-Rotterdam Crossing*

(Chapter 714, Laws of 1913)

For details of this contract see Report of State Engineer for 1916, page 67. The work was finished last year. The final account, amounting to \$39,861.43, was approved by the Canal Board on July 27, 1916.

*Forts Ferry Highway Improvement*

This work consists of the improvement of the highway between the Mohawk river and the old Erie canal at Forts Ferry. It has been done by John Shaw and Irving L. Taylor, contractors, under an agreement with the Superintendent of Public Works, dated May 20, 1916. Work was started in June, 1916, and completed September 13, 1916. The engineer's preliminary estimate was \$3,915.00 and the contractor's bid, \$3,210.50.

The final estimate amounted to \$2,486.85 and was approved by the Canal Board November 22, 1916.

J. C. Bell, Assistant Engineer, was in charge.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	4,080	2,288	3,632	56.1	89.0
Forming embankment.....cu. yds.	3,700	2,334	3,107	63.1	84.0
Wooden fence.....lin. ft.	2,470	544	544	22.0	22.0
Cast-iron pipe.....tons	15.8	15.279	15.279	96.7	96.7
Removing bridge superstructure.....lump sum	\$5 00	0	\$5 00	0.0	100.0
Gross estimate at contract prices.....	\$3,210 50	\$1,934 15	\$2,496 85	60.2	77.5

#### ERIE CANAL, MOHAWK RIVER RESIDENCY

Assistant Engineer M. E. James reports:

The so-called Mohawk River residency covers the canalization of 54.2 miles of the Mohawk river, extending from Mindenville on the west to Rexford Flats on the east. Within this distance and comprising this residency are located contracts Nos. 20-B, 20-C, 20-D, 86, 118 and 135, also terminal contracts Nos. 10, 12 and 22.

During the past year the residency office has been maintained in the Mark building, Amsterdam. All appropriation maps, release maps, retention maps and flood maps mentioned in the following report have been prepared in the residency office, also the location and contour maps which accompanied the several claims reported on.

During September and October, 1916, Resident Engineer A. E. Steere, then in charge of this residency, made an extensive study of a leakage under dam No. 5, at Rotterdam. Several boils were noticeable below the dam and there were points above where suction could be seen. Plans and sections were prepared in the residency office, which showed both the existing construction and a proposed method for repairing the dam and stopping the leakage. Mattresses were tied together and floated to the point where the suction above the dam was most noticeable and there they were

dropped down on the sill where they were evidently drawn into a large hole. This was done on October 27, 1916. After that date no boils were noticeable below the dam, but, as these mattresses would soon decay and the leakage reappear, it was proposed to construct a coffer-dam around the north span of the dam and make a more extensive survey of repairs necessary to place the dam in good condition. Plans for this coffer-dam were prepared in the residency office and submitted to Albany, and at the present time the coffer-dam is being constructed, with the upper pool being maintained at pool level. There is about 23 feet of water above this dam.

During the spring of 1917, all structures located on the canal such as locks, bridges, etc., were inspected and data taken to show the maximum controlling dimensions. The clearance under all bridges and the rectangular clearance at all locks were tabulated and forwarded to the Division Engineer.

Plans showing a proposed change in the center line opposite the American Locomotive Co.'s plant at Schenectady, also plans showing a proposed change in the center line just west of lock No. 9 at Rotterdam were prepared in the residency office and sent to Albany.

The engineering force on this residency during the year has been engaged at various times in making observations along the Mohawk river when floods occurred, marking high-water limits and getting the elevations of these heights. Considerable time was given by various members of the engineering parties in giving testimony before the State Court of Claims and in assisting the claim agents in investigating and locating the several properties which they were considering. In January, 1916, a flood occurred during which the waters of the South Chuctanunda creek overflowed its banks in the city of Amsterdam, causing a considerable number of claims to be filed against the State. An extensive survey was made in connection with these claims and maps were prepared in the residency office in connection with the Resident Engineer's report on the claims. The subject of speeds for full-sized vessels navigating the Barge canal channel on this residency was investigated and report made to the Division Engineer. Drawings to show the encroachment on the Mohawk river at



Four submarine chasers passing through one of the Barge canal locks on the Mohawk river.

2

Schenectady by the American Locomotive Co., also at Amsterdam by James Fusco, were prepared and sent to Albany. In connection with the Governor's war plan a detailed list of all contractor's plant available for war purposes was prepared and the location of each piece of plant was shown.

When the President of the United States issued a call for men for the army, E. D. Hendricks, Resident Engineer in charge of this residency, and C. E. Vedder, Junior Assistant Engineer, responded, and during May, 1917, reported at Madison Barracks, N. Y., for service in the Officer's Reserve Corps. Mr. Hendricks received a commission as first lieutenant before reporting, while Mr. Vedder went as an enlisted man in the reserve.

When navigation opened for the season of 1917, it was necessary to relocate the buoys marking the channel limits, and considerable time was spent doing this for the Department of Public Works. Also, we have had several heavy rains during the summer of 1917, which caused floods and high water in the Mohawk river. Upon these occasions a great many of the buoys became displaced and considerable time was spent with members of the Department of Public Works in relocating them.

Reports have been made upon accidents and upon the striking of obstructions in the channel by boats. The channel has been swept at various times and places to determine what these obstructions have been.

The final estimate for contract No. 118 was finished during the past year and the final estimate for contract No. 20-D is well progressed.

During the past year the work on this residency was under the supervision of A. E. Steere, Senior Assistant Engineer, until February 1, when Mr. Steere was transferred to Rochester. From February 1 to May 7, E. D. Hendricks, Senior Assistant Engineer, was in charge, while from May 7 to date the work has been under my direction.

#### *Contract No. 20-D*

This contract provides for dredging a channel in the Mohawk river and performing work incidental thereto between Sta. 2948 + 75, the upper miter-sill of lock No. 13 at Yosts, and deep

water below the aqueduct at Rexford Flats. Length, 36.2 miles. It was awarded to the American Pipe and Construction Co., being signed on August 18, 1909. Work was begun during October, 1909, but the first monthly estimate for construction work was that for May, 1911. The engineer's preliminary estimate was \$2,260,000.00, and the contractor's bid, \$2,681,040.40. The contract price as modified by alterations Nos. 2 to 9, inclusive, is \$3,151,104.40.

The contract was accepted by the Canal Board on March 22, 1917, with the provision that the contractor should execute an agreement with the Superintendent of Public Works to perform certain work not under the original contract. This agreement was signed on April 2, 1917. The final estimate for contract No. 20-D amounted to \$3,148,447.74 and was approved by the Canal Board January 6, 1918.

The work on this contract in section No. 2 was in charge of T. S. Bailey, Assistant Engineer, with office at Schenectady, and that portion of the contract on section No. 3 was in charge of M. E. James, Assistant Engineer, with office in the residency office at Amsterdam and field office at Fultonville.

The alterations on this contract are as follows:

Alteration No. 1, which proposed to eliminate the dike wall at Tribes Hill, was never executed.

Alteration No. 2, approved by the Canal Board November 22, 1910, provided for certain changes in spoil-banks. Contract quantities were not affected.

Alteration No. 3, approved by the Canal Board May 18, 1911, provided for straightening the channel below lock No. 11 at Amsterdam. It increased the contract price by \$4,437.00.

Alteration No. 4, approved by the Canal Board November 12, 1912, provided additional riprap below dams Nos. 6 and 9 and lock No. 10. It increased the contract price by \$35,406.00.

Alteration No. 5, approved by the Canal Board June 11, 1913, provided for changing the alignment of the canal from Sta. 2319 + 00 to Sta. 2419 + 01, between Akin, or Fort Johnson, and Tribes Hill. It decreased the contract price by \$22,491.00.

Alteration No. 6, approved by the Canal Board November 20, 1913, provided for additional second-class riprap below dam

No. 5 at Rotterdam. It increased the contract price by \$27,948.00.

Alteration No. 7, approved by the Canal Board February 23, 1915, provided for eliminating a portion of the concrete dike on the south side of the channel at the west end of lock No. 12 at Tribes Hill. It decreased the contract price by \$4,008.00.

Alteration No. 8, approved by the Canal Board May 18, 1915, provided for changing excavation and riprap below lock No. 8 at Scotia and for rock-spoil protection east of lock No. 8. Rock-spoil protection was a new item in the contract. The alteration increased the contract price by \$70,035.00.

Alteration No. 9, approved by the Canal Board May 3, 1916, provided for widening the channel and placing additional bank protection at various points. It increased the contract price by \$358,737.00.

Extra work order dated November 18, 1912, provided for making repairs to dam No. 5 at Rotterdam by driving piles, etc.

Extra work order dated September 30, 1915, provided for the removal from the prism of a sunken scow at approximately Sta. 1300 and placing protection around the base of the south pier of the Fonda-Fultonville bridge over the Mohawk river.

Extra work order dated January 5, 1916, provided for the construction of a wooden highway bridge at the aqueduct, Rexford Flats, owing to the removal of a portion of the aqueduct, and building a guard-rail the entire length of the aqueduct.

Extra work order dated November 14, 1916, provides for placing second-class riprap below dam No. 4 at Scotia.

Extra work order dated January 15, 1917, provides for the construction of a coffer-dam around the north span of dam No. 5 at Rotterdam and making repairs to dam No. 5.

Range stakes and gages have been set and maintained for the contractor during the year for carrying on the prism excavation. Original cross-sections ahead of the dredges have been taken, also sections have been taken at the end of each month and at the end of the season.

The plant on this contract consisting of three hydraulic dredges, three dipper-dredges, four derrick-boats and a fleet of tugs and dump and flat-bottomed scows, has progressed the work as follows during the past year.



The hydraulic dredge *Amsterdam* excavated in the back channel below dam No. 4 at Scotia and in the prism for a distance of about 1.98 miles just below lock No. 8 at Scotia; below lock No. 9 at Rotterdam, for a distance of about 0.24 mile; for 500 feet at 0.9 mile below lock No. 9; for about  $\frac{1}{4}$  mile at 1.2 miles below lock No. 9; at the B. & M. R. R. bridge and for about 0.3 mile east from the N. Y. C. R. R. bridge below Hoffmans Ferry, and at Morris island near Cranesville. It removed refill, or washed-in material for 500 feet below lock No. 8 above Scotia and for  $\frac{1}{4}$  to  $1\frac{1}{4}$  miles below lock No. 9, for 0.36 mile easterly from Washout creek and for 1.1 miles above lock No. 9. It also placed about 400 feet of bank protection near the Verf kill entrance. This dredge was dismantled on November 25 and taken to Waterford.

The hydraulic dredge *Mohawk* excavated in prism for 800 feet at 0.4 mile east of Akin; for 900 feet below lock No. 12 at Tribes Hill; below dam No. 8, Tribes Hill; below dam No. 7 at Amsterdam; 0.3 to 1.1 miles below lock No. 11 at Amsterdam; for about 2,000 feet near the easterly limits of Amsterdam; at Davey island east of the Amsterdam bridge; from about a mile west of Hoffmans Ferry to lock No. 10 at Cranesville and at Morris island. It excavated below dam No. 6 at Cranesville, refill or washed-in material below dam No. 7 and in the South Chuctanunda creek entrance. On December 3, 1916, it moved to Fultonville and started enlarging the harbor, depositing the excavated material in the old canal bed. On December 8 it discontinued work for the winter and underwent extensive repairs. In June, 1917, it was taken to Amsterdam, where repairing was continued at the machine shop of the Mohawk Valley Boat and Machine Co. preparatory to taking the dredge to Albany for use on other work.

The *Ontario*, a 16-inch hydraulic dredge owned by the New York State Dredging Corporation of Port Henry, was rented by the American Pipe and Construction Co. for use on this contract. It started work on July 6, 1916, and excavated in prism for 400 feet at the Schenectady-Ballston trolley bridge; for 746 feet just above the D. & H. R. R. bridge at Schenectady; for 1,850 feet east from the N. Y. C. R. R. bridge at Schenectady and for 2,700 feet west from Hoffmans Ferry. Excavation was made at the Flatstone creek entrance and the SanSai kill entrance, and refill,

or washed-in material was removed for 3,800 feet, one-half mile west of the Schenectady-Ballston trolley bridge, and for 1,100 feet from Hoffmans Ferry westerly. Early in November this dredge started enlarging the harbor at Cranesville. It discontinued this work on November 19 and left the site of this contract.

Dipper-dredge No. 1 excavated in prism from 1.4 miles east to 1.6 miles west of Auriesville; below dam No. 8 at Tribes Hill; for about two miles just west of Akin and for 400 feet above the bridge at Amsterdam. It excavated material for bank protection along 600 feet of the south bank 1.48 miles west of Akin and with the hydraulic dredge *Mohawk* it excavated bank protection along 3,600 feet of the south bank east of Akin. During November and December it removed high spots in the prism at various places and on December 4 moved to the harbor at Fultonville for the winter. It underwent repairs and alterations during the winter and early spring and early in May moved to a point just west of dam No. 8 at Tribes Hill and did excavation under alteration No. 9, which work was completed during June, 1917.

Dipper-dredge No. 3 excavated above dam No. 8 at Tribes Hill, below dam No. 9 at Yosts and removed bank projections in two places about a mile east of lock No. 10, Cranesville. With the hydraulic dredge *Mohawk* it excavated in prism for 8,300 feet east from the bridge at Amsterdam. It excavated material in the vicinity of the N. Y. C. R. R. bridge below Hoffmans Ferry and a small amount just east of Cranesville. It excavated refill, or washed-in material for 300 feet east of the bridge at Amsterdam. It placed bank protection for 500 feet, 1.5 miles east of Fonda; for 3,200 feet on the north bank, 0.5 to 1.1 miles east of lock No. 13; for 10,300 feet on the north bank opposite Auriesville; for 1,200 feet on the south bank just west of Auriesville, and for 2,900 feet on the south bank above lock No. 10. It also removed several high spots in the prism and worked on the enlargement of the harbor at Cranesville. On December 9 it stopped work and tied up for the winter in the Cranesville harbor. Alterations and repairs were made during the winter months and early spring, and in May, 1917, it excavated refill, or washed-in material along the lower guide wall of lock No. 10 at Cranesville and excavated below dam No. 6 at Cranesville. This work was continued during June.

Dipper-dredge No. 4 excavated in prism for 1,400 feet in the vicinity of Flatstone creek; for 1,400 feet westerly from the B. & M. R. R. bridge at Rotterdam; for 1,900 feet east of Flatstone creek; for 1,100 feet about a mile above lock No. 8, at Scotia; for 4,000 feet about two miles above lock No. 8; in the vicinity of the B. & M. R. R. bridge at Rotterdam and for 4,820 feet easterly therefrom. It also excavated in Flatstone creek entrance and in the creek entrance  $\frac{1}{3}$  mile east of the B. & M. R. R. bridge and placed a little bank protection. The dredge moved into the Cranesville harbor early in December for the winter. Repairs and alterations were made during the winter and early spring, and in June, 1917, it was taken to Weehawken, N. J., for repairs on dry dock.

Derrick-boat No. 2, during July, 1916, placed second-class riprap below dam No. 7 at Amsterdam under alteration No. 9. This work was continued during August and September. During October it placed second-class riprap below dam No. 8 at Tribes Hill, under alteration No. 9, and during November it placed second-class riprap against the south slope below dam No. 8 under this same alteration. In December this boat moved to Cranesville and laid riprap protection at the harbor. Later in the month it worked at the site of the Amsterdam city bridge, removing old bridge piers under contract No. 118.

Derrick-boat *Franklin R* placed 2,800 feet of bank protection along the north bank, 1.4 miles above lock No. 12 at Tribes Hill, and 1,900 feet along the north bank about  $\frac{1}{3}$  mile east of Fonda. During August it excavated fill in lock No. 12 at Tribes Hill and worked on bank protection. During the remainder of the season this boat excavated at various places, removing high spots in the prism.

The derrick-boat 10-60, during July and August, placed second-class riprap below dam No. 5 at Cranesville and in August it placed 3,800 feet of bank protection below lock No. 9 at Cranesville. During September the work of placing second-class riprap below dam No. 5 was continued. During October and November it placed second-class riprap below dam No. 4 at Scotia under alteration No. 9, also fourth-class riprap against the north slope below this dam. During November this boat also placed second-class riprap below dam No. 4 at Scotia under the extra

work order dated November 14, 1916. In December the work of placing fourth-class riprap against the north slope was continued. In May, 1917, the work of placing second-class riprap under the extra work order dated November 14, 1916, was continued, also during June, 1917.

The other derrick-boat on this contract, during July, 1916, placed fourth-class riprap below dam No. 4 at Scotia under alteration No. 9. This work was continued through August. During the remainder of the season this boat excavated at various points, removing high spots in the prism.

The derrick-boats and tugs were all in winter quarters early in December, 1916, and during the winter and spring months repairs and alterations to the plant were carried on.

During the fall of 1916 and the spring of 1917, work was continued at the Tribes Hill and Swartstown quarries, getting out stone for riprap below the various dams on this contract. Under a permit dated September 22, 1916, the contractor removed the stone from old lock No. 24 on the Erie canal for use as riprap below dam No. 4 at Scotia. This work was done during October and November, 1916.

Early in January, 1917, a traveler was erected at the Rexford Flats aqueduct and the removal of the timber trunk was started. This work was continued during February, March and April. The timber trunk was entirely removed, except the most southerly span, which was left in place for possible future dockage purposes.

Under an extra work order dated January 15, 1917, the contractor did some work at dam No. 5, Rotterdam, in the early part of the year, to determine, if possible, the location of a leak under this dam. Plans were prepared for a proposed coffer-dam to be built around the north span of the dam, for the purpose of ascertaining what repairs were needed to stop the leak. Early in March, large timbers removed from the aqueduct at Rexford Flats were hauled to dam No. 5 for use in this coffer-dam and also steel piling for use in the coffer-dam was ordered. During April 1917, before this coffer-dam was in position, a small bag coffer-dam was built around the sill of the north span. This was started on April 13 and later in the month the crack located between the original sill of the dam and the slab of concrete placed

under contract No. 119 was concreted. Two holes were drilled through this slab and at one a void  $3\frac{1}{2}$  feet deep was found and at the other a void of  $1\frac{1}{2}$  feet. Pipes were placed in these holes and early in May, after the dam was in place, the voids were grouted.

During May the round piles and timber were delivered for the coffer-dam. The crib at the upper end of the river wall was built and filled. In June the work of driving round piles for the coffer-dam was started and progressed well until June 12, when a flood occurred and several of the piles already driven were broken and carried away, as was also a cluster of anchorage piles used by the derrick-boat which drove the piles. After the flood the piles broken off were redriven. By June 30 about 20 round piles were in place along the inside line of the coffer-dam, wales were in place and the triple-lap sheeting was started out from the crib along the river wall. The steel piling is all on the site of the work and with favorable weather it is expected that this work will progress rapidly after July 1.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$720	\$144	\$720	20.0	100.0
Grubbing..... cu. yds.	195	0	0	0.0	0.0
Excavation..... cu. yds.	5,708,800	629,427	5,761,654	11.0	100.9
Sheeting and bracing..... ft. B. M.	8,000	0	0	0.0	0.0
Round timber bracing..... lin. ft.	450	0	0	0.0	0.0
Forming embankment..... cu. yds.	1,000	0	0	0.0	0.0
Lining..... cu. yds.	650	0	435	0.0	66.9
Second-class concrete..... cu. yds.	66	0	61.2	0.0	92.7
First-class stone paving..... sq. yds.	3,600	23	2,830	0.6	78.6
First-class riprap..... cu. yds.	2,000	8	860	0.4	43.0
Second-class riprap..... cu. yds.	32,740	19,954	28,675	60.9	87.6
Third-class riprap..... cu. yds.	1,200	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	10,300	1,424	6,153	13.8	59.7
Rock spoil protection..... cu. yds.	*48,519	3,833	48,519	7.9	100.0
Gross estimate at contract prices	*\$3,160,882.90	\$409,094.07	\$3,148,447.74	12.8	99.6
<i>Extra Work Orders</i>					
Nov. 18, 1912.....	cut plus 15 per cent		\$42,891.23		Finished
Sept. 30, 1915, lump sum and contract unit price	\$1,973.00		1,484.63		Finished
Jan. 8, 1916.....	cut plus 15 per cent				
Nov. 14, 1916.....	contract unit price	18,000.00	2,862.20		Finished
Jan. 18, 1917.....	cut plus 15 per cent		2,203.20		
Total			\$49,421.26		

\* Figures given include an excess grant to a contract by the Canal Board, as follows:

\$319.00 on rock spoil protection by resolution dated January 9, 1915.

The quantity at the contract price amounts to \$9,778.50.

During the past year, surveys were made and appropriation maps prepared and sent to the Division Engineer for the following: Map releasing parcel No. 4,467, Chas. Young; map releasing parcel No. 5,023, George Kellum; map releasing parcel No. 4,795, Shakers; map releasing part of parcel No. 4,788, Shakers; map retaining part of parcel No. 4,788, Shakers. Also perpetual-right-to-flood appropriation maps for the following properties: Haselo estate, Ferdinand Glindmeyer, Henry Dufel and Chas. Witte-meier. Also a permanent appropriation map for the Haselo estate.

Gages located on this contract were inspected during the year and some slight changes made at the Tribes Hill and Fonda gages.

The channel on this contract was swept during October, 1916, from lock No. 13 at Yosts to the Hoffmans railroad cross-over bridge, by the engineering force from this office and a report on its condition was forwarded to the Division Engineer.

In preparing the right-of-way maps, which show all State lands, together with the location of the canal and structures, it was found that errors had been made in some of the early appropriation maps for contracts Nos. 14, 17, 8 and 20-D, and terminal contracts. Considerable time was taken in rerunning and recomputing some of these surveys; also in computing ties to the center line of the canal and to the monumented base line of the canal.

During the past year, properties were investigated and reports on the following claims, together with maps showing the topography and location of the properties involved, were made and forwarded to the Division Engineer: A general report covering numerous claims along South Chuctanunda creek, Amsterdam; a general report covering numerous claims in the vicinity of Schenectady; Franklin Vedder, claim No. 13,761; John S. Smith and George S. Van Voast, claim No. 2,846-A; L. Ten Broeck and Livingston Sanders, claim No. 2,844-A; William H. Campbell, claim No. 2,845-A; Prudence Mott, claim No. 14,421; Edward Roselle, claim No. 14,726; Henry Dufel, claim No. 14,723; Henry Dufel, claim No. 14,722; Charles Wittemeier, claim No. 14,725; Henry Lohmeyer, claim No. 14,724; Watson S. Vrooman, claim No. 14,691; George L. Sandy, claim No.

January, 1917, the six signal lamps on the bridge were installed. In May the derrick-boat belonging to the American Pipe and Construction Co. finished the removal of the old bridge piers and finished placing the riprap protection around the south pier, which concluded the construction work on this contract.

Contract No. 118 was accepted by the Canal Board on June 6, 1917.

The following table shows the contract and final estimate quantities with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Coffer-dams, pumping, bailing and draining.....	lump sum \$19,000	\$950	\$19,000	5.0	100.0
Excavation.....	cu. yds. 6,108	1,472	1,502	24.1	73.7
Foundation piles.....	lin. ft. 11,980	0	3,283	0.0	27.3
Wrought-iron pipe railing.....	lin. ft. 100	49	49	49.0	49.0
Second-class concrete.....	cu. yds. 5,081	0	4,305	0.2	85.7
Reinforced concrete.....	cu. yds. 718	313.8	677.8	43.9	94.8
Metal reinforcement.....	lbs. 140,800	51,043	107,254	36.3	76.2
Riprap.....	cu. yds. *402	402	402	100.0	100.0
Structural steel.....	lbs. 1,667,000	44,533	1,798,053	2.7	107.8
Portland cement sidewalks.....	sq. ft. 1,880	1,312	1,312	70.5	70.5
Stone curbs.....	lin. ft. 180	127	127	79.4	79.4
Brick pavement.....	sq. yds. 250	237	237	94.8	94.8
Lattice railing.....	lin. ft. 900	0	888	0.0	96.4
Asphalt-block pavement.....	sq. yds. 1,550	890	1,575	57.4	101.6
Maintaining highway traffic.....	lump sum \$4,000	0	\$4,000	0.0	100.0
Removing boat-house and rebuilding dockwall.....	lump sum \$800	0	\$800	0.0	100.0
Removing existing bridge.....	lump sum \$1,000	\$800	\$1,000	80.0	100.0
Maintaining navigation.....	lump sum \$600	0	\$600	0.0	100.0
Oil signal-lamps.....	No. 6	6	6	100.0	100.0
Laying railroad track.....	lin. ft. 886	216	436	24.5	49.5
Steel sheet-piling.....	sq. ft. *7,154	1,910	7,154	26.2	100.0
Gross estimate at contract prices.....	*\$157,665 00	\$14,636 87	\$152,580 17	9.3	96.8
<i>Extra Work Orders</i>					
Jan. 14, 1916.....	lump sum \$2,000 00	.....	\$2,000 00	.....	Finished
June 5, 1917.....	lump sum 31 05	.....	.....	.....	.....

\*Figures given include excess quantities authorized by the Canal Board, as follows:

Riprap, 122 cu. yds., by resolution dated July 11, 1917.

Steel sheet-piling, 2,600 sq. ft., by resolution dated Nov. 18, 1915.

Steel sheet-piling, 54 sq. ft., by resolution dated July 11, 1917.

These quantities at the contract prices amount to \$2,854.00.

### Contract No. 20-C

This contract provided for dredging a channel in the Mohawk river and performing incidental work thereto between Sta. 3361 + 85, the upper miter-sill of lock No. 14 at Canajoharie, to Sta. 2948 + 75, the upper miter-sill of lock No. 13 at Yosts. American Pipe and Construction Co., contractors.

The work on this contract was looked after by A. P. Mussi, Assistant Engineer, working from the Amsterdam residency office, and by Chas. R. Waters, Assistant Engineer, working from the residency No. 3 office at Fort Plain.

As this contract was completed and accepted prior to the beginning of this fiscal year, there is no report to be made on construction work.

Surveys were made and appropriation maps prepared for the lands of Peter Schuyler and Herman Lasher, and forwarded to the Division Engineer. An appropriation map releasing parcel No. 3,586, lands of Oscar Van Evra, was also sent to Albany. A map releasing part of parcel No. 3,581 and a map retaining part of parcel No. 3,581, land of Oscar Van Evra, were also prepared and sent to the Albany office during the year.

Various properties along the line of this contract have been under observation during the past year, also gage readings taken and other data collected in connection with claims against the State due to Barge canal construction and maintenance. The gages on this section of the canal were inspected during the year and checked.

The channel on this contract was swept in October, 1916, by the engineering force from this office and a report on its condition was forwarded to the Division Engineer.

In preparing the right-of-way maps, which show all State lands, together with the location of the canal and structures, it was found that errors had been made in several of the early appropriation maps for contracts Nos. 14 and 20-C. Considerable time was spent in rerunning and recomputing some of these surveys, also in correcting ties to the center line and the monumented base line of the canal, and in some cases to the base line of the old Erie canal blue line survey.

#### *Contract No. 135*

This contract provides for excavating a point of land on the south bank of the Mohawk river between the bridge and dam No. 10 at Canajoharie and performing incidental work. Great Lakes Dredge and Dock Co., contractors.



Preliminary work in connection with this contract was carried on by this office during the fall of 1916 and spring of 1917. On or about May 1 it was transferred to Residency No. 3. Therefore report of construction work will be made by Senior Assistant Engineer D. C. Wedgeworth. The construction work was started after Mr. Wedgeworth assumed charge of this contract.

*Contract No. 20-B*

This contract provided for the dredging of a channel in the Mohawk river and performing work incidental thereto between Sta. 3872 + 35, the upper miter-sill of lock No. 16 at Mindenville, to Sta. 3361 + 85, the upper miter-sill of lock No. 14 at Canajoharie. S. Pearson & Son, Inc., contractors.

The work on this contract during the year was looked after by A. P. Mussi, Assistant Engineer, working from the Amsterdam residency office, and by Chas. R. Waters, Assistant Engineer, working from residency No. 3 office at Fort Plain.

As this contract was completed and accepted prior to the beginning of this fiscal year, there is no report to make on construction work.

Surveys and appropriation maps for the lands of William D. Allen and George R. Allen were made and forwarded to the Division Engineer, also an appropriation map releasing part of parcel No. 1,677, lands of A. and C. A. Hix, and a map retaining part of parcel No. 1,677. Resurveys were made for the lands of Edward Youker and Irvin Miller and appropriation maps sent to Albany, also a new appropriation map for the lands of Peter F. Nellis, to supersede parcel No. 4,736.

The property of Earl Bellinger was investigated, as well as various other properties along the line of this contract, in connection with claims against the State due to Barge canal construction and maintenance.

During the past year, reports on the following claims, together with maps showing the topography and location of the properties involved, have been made and forwarded to the Division Engineer: Edward Youker, claim No. 14,710; Kate M. and Lena A. Nellis, claim No. 14,692; Irvin Miller, claim No. 14,709; John Rhinehart, claim No. 14,735.

Gages located on this contract were inspected during the year. The St. Johnsville gage was repaired and replaced.

The channel on this contract was swept during October, 1916, by the engineering force from this office and a report on its condition was forwarded to the Division Engineer.

In preparing the right-of-way maps, which show all State lands, together with the location of the canal and structures, it was found that errors had been made in several of the early appropriation maps for contracts Nos. 14 and 20-B. Considerable time was taken in rerunning and recomputing some of these surveys, also in correcting ties to the center line and the monumented base line of the canal, and in some cases to the base line of the old Erie canal blue line survey. Considerable time was spent in computing and compiling data in connection with the claim against the State by S. Pearson & Son, Inc., contractors on this contract. This work was later taken over by Chas. R. Waters, Assistant Engineer, and a more detailed report will be made by D. C. Wedgeworth, Senior Assistant Engineer, in charge of residency No. 3.

*Terminal Contract No. 12 —Amsterdam*

This contract provided for the construction of a harbor and dockwall on the north side of the Mohawk river near the New York Central railroad station at Amsterdam. American Pipe and Construction Co., contractors.

As this contract was finished prior to the beginning of this fiscal year, there is no report to be made on construction work.

During the past year a report, accompanied by the usual location map, was made on claim No. 14,673, New York Central R. R. Co., in connection with this contract.

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ERIE CANAL, RESIDENCY No. 3

Senior Assistant Engineer D. C. Wedgeworth reports:

This residency extends from old lock No. 27, near Cranesville, to old lock No. 34, near Mindenville. The work on this residency was in charge of Ernest D. Hendricks, Resident Engineer, until the first of June, when he entered the Officer's Reserve Corps.

The contracts on this residency covered by the report are Nos. 120, 135 and 137 and terminal contracts Nos. 37 and 40. Also blue line surveys on the old canal have been made.

*Contract No. 120*

This contract was for the reinforcement of seven movable dams in the Mohawk river, Nos. 5 to 11, inclusive. It was let to Whitehead & Kales Ironworks of Detroit, Michigan, being signed on July 29, 1914. The engineer's preliminary estimate was \$273,484.00 and the contractor's bid, \$265,954.00.

This contract was accepted on June 27, 1917, and the final estimate, amounting to \$279,750.04, was approved by the Canal Board December 19, 1917.

L. C. West, Assistant Engineer, was in charge.

Extra work order dated October 28, 1915, provided for cables and poles to be replaced in connection with installing trolley brackets on the bridges.

Extra work order dated July 10, 1916, provided for the furnishing and placing of new lumber and refitting and laying of old lumber on the sidewalks of all dams in the contract.

The work covered by these orders has been completed.

At dams Nos. 5, 6, 8 and 9, the steelwork having been finished, plank flooring on sidewalks and wickets was laid and painting done. This was done between August and October, 1916. At dam No. 7 such work of strengthening as could be done with the dam in operation was finished by August 1. From December to April, work proceeded on this dam, so that all painting and laying of floors necessary to complete the work was done by June 14. At dam No. 10 the reinforcement was finished August 7, and the painting and flooring on sidewalks and wickets in November. At dam No. 11 the reinforcement of steel was resumed as soon as the dam was out of operation. This work was continued until March 21. The flooring on sidewalks and wickets was laid during April and May. All painting was finished by June 7.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Structural steel.....lba.	3,800,000	269,464	3,867,763	7.1	101.8
Reinforcing metal.....lba.	840,000	249,727	956,853	29.7	113.9
New wrought-iron chain.....lba.	99,000	32,417	86,819	32.7	87.7
Sawed lumber.....ft. B. M.	*32,000	31,716	31,716	99.1	99.1
Replacing truss bearings.....No.	46	0	46	0.0	100.0
Adjustment of new trusses.....No.	23	5	23	21.7	100.0
Wrought-iron pipe railing.....lin. ft.	8,300	1,633	3,122	49.2	94.6
Installing trolley brackets.....No.	138	50	118	36.3	85.5
Gross estimate at contract prices.....	*\$266,374 00	\$42,237 51	\$279,750 04	15.9	105 0
<i>Extra Work Orders</i>					
Oct. 28, 1915.....special unit price	\$315 00	.....	\$315 00	.....	Finished
July 10, 1916.....special unit price	2,454 00	.....	.....	.....	.....
Total.....	\$2,669 00	.....	\$215 00	.....	.....

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Sawed lumber, 7,000 ft. B. M., by resolution dated July 11, 1917.  
This quantity at the contract price amounts to \$420.00.

### Contract No. 135

This contract is for the removal of a projecting bank of the river below dam No. 10, at Canajoharie, and the removal of material in the channel farther down the river. It was let to the Great Lakes Dredge & Dock Company of Albany, N. Y., the contract being signed on September 18, 1916. The engineer's preliminary estimate was \$78,052.00, and the contractor's bid, \$57,038.00.

H. C. Kline, Assistant Engineer, is in charge.

The work was begun by a small hydraulic dredge on April 24, 1917. On May 16 the 20-inch hydraulic dredge *Massachusetts* began the main part of the work, spoiling the material in the old Erie canal.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	150,100	103,232	68.8
Gross estimate at contract prices.....	\$57,038 00	\$39,228 16	68.8

*Contract No. 137*

This contract is for driving steel sheet-piling at dam No. 10, Canajoharie, and other incidental work. It was let to J. A. Laporte of Mechanicville, N. Y., being signed on October 13, 1916. The engineer's preliminary estimate was \$25,333.00, and the contractor's bid, \$22,650.00.

H. C. Kline, Assistant Engineer, is in charge.

The first pile was driven October 31, 1916, being interlocked by a diver with piles previously driven. The old coffer-dam has been removed, the piles having been pulled with an "A" frame. The close of the year found the piling of the north span driven and sealed with a cap of concrete.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	2,800	573	20.5
Removing second-class riprap.....cu. yds.	115	0	0.0
Second-class concrete.....cu. yds.	305	67	22.0
Pulling steel sheet-piles.....No.	\$25	467	89.0
Pulling wooden piles.....No.	135	83	61.5
Removing wooden sheeting.....lin. ft.	360	335	98.0
Cutting steel sheet-piles.....No.	520	355	68.3
Driving steel sheet-piles.....lin. ft.	12,620	8,300	65.8
Furnishing steel sheet piles.....lbs.	176,690	133,824	75.8
Placing riprap.....cu. yds.	110	0	0.0
Gross estimate at contract prices.....	\$22,650 00	\$13,179 67	58.2

*Construction Work—Barge Canal*

The Barge canal work done on section 3 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE						
	Contract No. 14 (section 3)	Contract No. 17 (Seo-field)	Contract No. 17 (Murdoch)	Contract No. 20-B	Contract No. 20-C	Contract No. 20-D (section 3)	Contract No. 20-D, special agreement (section 3)
1907.....		\$44,630					
908.....	\$104,000	†12,564	\$127,500				
909.....	372,540		268,340	\$80			
910.....	283,400		165,050	9,180	\$7,640		
911.....	218,750		178,090	151,950	316,620	\$60,120	\$5,800
912.....	96,300		12,372	298,500	269,930	189,080	23,400
913.....				303,160	28,010	461,000	
914.....	14,566			212,640	35,828	320,550	

YEAR*	VALUE OF WORK DONE						
	Contract No. 14 (section 3)	Contract No. 17 (Sunfield)	Contract No. 17 (Murdock)	Contract No. 20-B	Contract No. 20-C	Contract No. 20-D (section 3)	Contract No. 20-D, special agreement (section 3)
1915.....				\$21,970		\$201,890	
1916.....				17,103		56,599	
1917.....						171,312	\$8,633
Totals..	\$1,089,556	\$57,194	\$751,352	\$1,014,603	\$658,026	\$1,460,512	\$8,633

Extra Work Orders Paid, 1907-1917, Inclusive							
1909.....	\$731		\$586				
1910.....	9,908		621				
1911.....	5,928		301				
1912.....	2,782		227		\$3,829		
1913.....	1,380		1,082	\$1,421			
1914.....				365			
1915.....							
1916.....				1,970		\$1,290	
1917.....							
Totals..	\$20,729		\$2,917	\$3,756	\$3,829	\$1,290	

YEAR *	VALUE OF WORK DONE						Totals
	Contract No. 86	Contract No. 92 (section 3)	Contract No. 118	Contract No. 120 (section 3)	Contract No. 135	Contract No. 137	
1907.....							\$44,630
1908.....							244,064
1909.....							640,960
1910.....							465,270
1911.....							931,390
1912.....	\$4,940						894,522
1913.....	33,240	\$240					825,670
1914.....	288	131,470	\$290				715,630
1915.....		165,770	61,090	\$13,360			464,080
1916.....		12,624	76,560	157,119			319,957
1917.....			14,640	29,948	\$39,220	\$13,170	276,923
Totals..	\$38,468	\$310,104	\$152,580	\$200,418	\$39,220	\$13,170	\$5,823,086

Extra Work Orders Paid, 1907-1917, Inclusive							
1909.....							\$1,417
1910.....							10,529
1911.....							6,229
1912.....							6,838
1913.....							3,883
1914.....	\$696						1,061
1915.....		\$981					981
1916.....			\$2,000				5,260
1917.....				\$145			145
Totals..	\$696	\$981	\$2,000	\$145			\$36,843

\* The years 1907 to 1915 inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

† Figures given include \$3,400, the approximate value of work done by the Superintendent of Public Works.

NOTE.—No extra work orders were paid on this section during 1907 and 1908.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 14, sections 1 and 2, Erie canal; contracts Nos. 20-D and 36, section 2, Erie; contract No. 92, sections 1, 2 and 4, Erie, and sections 1 and 2, Champlain; contract No. 120, section 2, Erie.

*Terminal Contract No. 204*

This contract is for constructing temporary warehouses at Schenectady, Amsterdam, Fonda, Ilion and Frankfort. It was let to Byron, Forman & Riggs, Inc., of Cohoes, being signed on March 12, 1917, and was assigned to Kennedy and Scullen on April 23, 1917, the assignment being approved by the Superintendent of Public Works on May 2, 1917. Work was started at Amsterdam on March 17. The engineer's preliminary estimate for the warehouses at Amsterdam and Fonda, on this section, was \$1,975.00, and the contractor's bid, \$1,797.25. The contractor's bid for these two warehouses as modified by alteration No. 1 was \$10,006.60.

R. B. Smith is the engineer in charge.

Alteration No. 1, approved by the Canal Board April 12, 1917, provides for increasing the size of the warehouses. It increases the whole contract price by \$14,671.60.

The Amsterdam warehouse was well under way on March 23, when work was halted to change the size of the warehouses. Shortly after April 19, Kennedy & Scullen began the completion of this warehouse. The construction at Fonda was delayed by high water. Both buildings have now been turned over for use, but the lighting systems are not completed.

For details of the quantities estimated see the report of this contract in Residency No. 2, Erie canal.

*Terminal Contract No. 37 — Canajoharie*

This contract is for the construction of a harbor and dockwall near the outlet of Canajoharie creek at Canajoharie. It was let to Holler and Shepard of Rochester, N. Y., being signed August 26, 1915. Work began June 16, 1916. The engineer's preliminary estimate was \$33,832.00, the contractor's bid, \$32,272.00.

H. C. Kline, Assistant engineer, is in charge.

The design of the dockwall is a light reinforced concrete wall supported on large reinforced interlocking concrete piles, the wall being securely anchored in the fill. Every indication showed an unstable support for this dockwall, but it was found impossible to drive these large piles, because of boulders and the peculiar nature

of the soil. A trench was excavated by means of a clam-shell bucket and piles were then driven to refusal. On the piles thus driven the wall is being constructed according to design.

A large amount of back-fill has been made by the hydraulic dredge which is excavating the harbor. The year closed with good progress being made.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	24,000	13,350	13,691	55.6	57.0
Forming embankment.....cu. yds.	900	0	0	0.0	0.0
Crossed lumber.....ft. B. M.	4,200	0	0	0.0	0.0
Foundation piles.....lin. ft.	1,300	1,064	1,064	82.0	82.0
Reinforced concrete sheet-piles.....lin. ft.	5,300	3,444	3,444	65.1	65.1
First-class reinforced concrete.....cu. yds.	250	0	0	0.0	0.0
Second-class reinforced concrete.....cu. yds.	110	0	0	0.0	0.0
Concrete-slab pavement.....sq. yds.	2,400	0	0	0.0	0.0
Third-class riprap.....cu. yds.	300	0	0	0.0	0.0
Structural steel.....lbs.	21,000	0	0	0.0	0.0
Metal reinforcement.....lbs.	19,000	0	0	0.0	0.0
Iron castings, plain.....lbs.	2,700	0	0	0.0	0.0
Malleable cast-iron no.ing.....lin. ft.	420	0	0	0.0	0.0
Fender fastenings.....No.	65	0	0	0.0	0.0
Gross estimate at contract prices.....	\$32,272 00	\$13,360 20	\$13,389 78	41.1	41.5

#### *Terminal Contract No. 208*

This contract is for constructing terminal warehouses at Fort Plain and Little Falls. It was awarded to the Kennedy & Scullen Construction Company, of Cohoes, being signed on May 7, 1917. Work on the contract was begun at Fort Plain on May 17, 1917. The engineer's preliminary estimate for the warehouse at Fort Plain, on this section, was \$4,570.00, and the contractor's bid, \$4,639.38.

W. C. Benedict, Assistant Engineer, has been in charge of the work on this contract.

Both warehouses were practically completed during June, except for the electrical work.

For details of quantities estimated see report of this contract in Residency No. 4.



*Terminal Contract No. 40 — St. Johnsville*

This contract is for the construction of a harbor and dockwall at St. Johnsville. It was let to J. E. Bishop of Syracuse, N. Y., being signed on September 20, 1915. After a part of the excavation had been done, work discontinued until August 1, 1916, when the contract was assigned to Scott Brothers of Rome, N. Y. The engineer's preliminary estimate was \$27,963.00, the contractor's bid, \$25,515.81. The contract price as modified by alteration No. 1 is \$27,762.37.

Charles R. Waters, Assistant Engineer, is in charge.

Under alteration No. 1, approved by the Canal Board February 23, 1916, the limits of the entrance channel were changed, also the type of dockwall, with some other minor changes. Increase due to alteration, \$2,246.56.

Excavation for the dockwall was done in the dry, after the construction of a coffer-dam across the entrance and the unwatering of the site. After the dockwall had been constructed and some excavation had been done, the coffer-dam was removed and excavation was completed with a hydraulic dredge. Ample landing area is provided and roadway has been constructed to the adjacent highway.

Work is nearly completed at the close of the year.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	30,400	15,535	21,354	51.1	70.3
Forming embankment.....cu. yds.	0,000	2,969	5,489	46.8	91.5
Gravel surfacing.....cu. yds.	860	778	778	90.5	90.5
Crossed lumber.....ft. B. M.	3,400	3,000	3,000	88.2	88.2
Foundation piles.....lin. ft.	400	0	0	0.0	0.0
Second-class concrete.....cu. yds.	32	17	29	53.1	90.6
24-in. reinforced concrete pipe.....lin. ft.	150	4	140	2.7	93.3
Iron castings, plain.....lbs.	2,000	1,884	1,884	94.2	94.2
Wooden fence.....lin. ft.	448	442	442	98.7	95.7
Fender fastenings.....No.	55	50	50	90.9	90.9
Second-class concrete in dockwall.....cu. yds.	1,700	1,561	1,561	91.8	91.8
Malleable cast-iron mooring.....lin. ft.	340	330	330	97.1	97.1
Removing old dock.....lump sum	\$100	\$80	\$80	80.0	80.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$1,500	\$975	\$1,275	65.0	85.0
Gross estimate at contract prices.....	\$27,762 37	\$19,733 80	\$22,986 57	71.1	82.8

*Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 3 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE							Totals
	Contract No. 10	Contract No. 12	Contract No. 22	Contract No. 37	Contract No. 40	Contract No. 204 (section 3)	Contract No. 208 (section 3)	
1913.....	\$29,820	\$6,800	\$1,730	.....	.....	.....	.....	\$38,250
1914.....	27,860	38,160	17,320	.....	.....	.....	.....	83,340
1915.....	.....	13,549	3,769	.....	.....	.....	.....	17,318
1916.....	.....	.....	.....	\$120	\$3,250	.....	.....	3,370
1917.....	.....	.....	.....	18,260	19,780	49,800	\$4,320	47,310
Totals..	\$57,750	\$58,309	\$22,839	\$13,380	\$22,960	\$49,800	\$4,520	\$189,608
<i>Extra Work Orders Paid, 1916-1917, Inclusive</i>								
1915.....	.....	\$1,500	.....	.....	.....	.....	.....	\$1,500
Totals..	.....	\$1,500	.....	.....	.....	.....	.....	\$1,500

\* The years 1918 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.— No extra work orders were paid on this section during 1918, 1914, 1916 and 1917. The other sections on which work has been done under certain of the above terminal contracts are as follows: Contract No. 204, sections 2 and 4, Erie canal; contract No. 208, section 4, Erie.

## ERIE CANAL — RESIDENCY No. 4

Senior Assistant Engineer E. A. Lamb reports:

This residency extends from 0.5 mile east of old lock No. 34, Mindenville, to the Herkimer-Oneida county line, a distance of 27.8 miles.

Contracts Nos. 18, 18-A, 20-A, 29, 29-A, 30, 30-A, 31, 87, 107, 122, 122-A and 133 and portions of contracts Nos. 13, 92, 153 and 158, also terminal contracts Nos. 3, 9, 11 and 27 and portions of terminal contracts Nos. 101, 204 and 208 are located within the limits of this residency.

During the year a record has been kept of the daily readings of the gage located on the dam for the hydraulic canal on West Canada creek and of measurements of the daily flow through the head-gates.

In this office, besides the regular routine of weekly reports, correspondence, checking monthly estimates, etc., five appropriations have been mapped, checked and sent to the Division Engi-

neer's office since June 30, 1916. About thirty-three maps have been made to accompany reports to the Division Engineer on claims, complaints, released land, applications for use of land, permits, etc.

### *Blue Line Surveys*

(Chapter 181, Laws of 1917)

Surveys of the State land along the old canal in Little Falls and as far east as the present suspension bridge have been made and regular blue line maps of this stretch of canal prepared during the year. This work was started early in the year, because the city of Little Falls had made application for nearly all of this land not needed for the Barge canal. I understand the city plans to use a part of it for a park and a part for a sewage disposal plant.

### *Contract No. 18-A*

This contract provides for the completion of the canal from lock No. 16, Mindenville, to the westerly end of Little Falls (beginning of contract No. 30, a distance of 8.91 miles, and embraces the work remaining to be done on portions of contracts Nos. 18 and 20-A and also that within the limits of contract No. 31 which is necessary to make this section of the canal ready for Barge canal traffic. It was awarded to the New York State Dredging Corporation, the contract being signed on February 17, 1914, and work was begun at once. The amount of the engineer's preliminary estimate was \$1,591,536.36. The contractor's original bid was \$1,654,757.36 and, as modified by alterations 1, 2, 3, 4 and 5, it was \$1,698,784.21.

The work was accepted December 13, 1916, and the final account, amounting to \$1,668,069.38, was approved by the Canal Board April 12, 1917.

W. C. Benedict, Assistant Engineer, was in charge.

The alterations on this contract are as follows:

Alteration No. 1, approved by the Canal Board July 8, 1914, provides for substituting steel for wooden sheet-piling. This effected an increase in quantities amounting to \$16,498.00

Alteration No. 2, approved by the Canal Board December 4, 1914, provides for eliminating a portion of the retaining wall opposite the mouth of East Canada creek; for steel sheet-piling

easterly from end of wall to Sta. 3995; for a temporary lock at Sta. 3989, and for eliminating approach wall below lock No. 17. This effected a decrease in quantities amounting to \$35,912.65.

Alteration No. 3, approved by the Canal Board October 26, 1915, provides for building a dike at the south end of Rocky Rift dam; for widening the prism above lock No. 16; for protecting banks at certain places, and for installing valves and equipment for side-pool at lock No. 17. This effected an increase in quantities amounting to \$54,244.50.

Alteration No. 4, approved by the Canal Board September 27, 1916, provides for placing guide-cribs at lower approach to lock No. 17; for placing third-class riprap on the canal banks at various points, and for increasing the thickness of the puddle in the bottom of the canal at the foot of the retaining wall on the north side above lock No. 17. This effected an increase in quantities amounting to \$16,489.70.

Alteration No. 5, approved by the Canal Board November 22, 1916, provides for eliminating the placing of concrete tops on the nine cribs below lock No. 17. This effected a decrease in quantities amounting to \$7,292.70.

The extra work orders under contract No. 18-A are as follows:

Extra work order dated August 20, 1914, provided for the removal of the existing wooden pavement from the bridge at Sta. 3951 + 12 and the laying of a double plank floor consisting of a 3-inch bottom layer treated with two brush coats of an approved preservative and a 2-inch plank wearing surface. Payment amounted to \$827.54, at contract and special unit prices.

Extra work order dated June 14, 1915, provided for the placing of gravel lining, the construction of timber guide-cribs and the placing of snubbing-posts, plank walks, etc., at junction lock, Sta. 3990. Payment amounted to \$5,782.61, at special unit prices.

Extra work order dated January 29, 1916, provided for the pumping out of lock No. 17 and the removal of any debris, forms, false work and other obstructions within the lock. Payment amounted to \$5,189.08, on a cost plus 15 per cent basis.

Extra work order dated August 10, 1916, provided for the furnishing and placing of wrought-iron pipe railing extending

from the end of the existing railing at the guard-gate easterly to Sta. 4331 + 45, connecting with that already in place. Payment amounted to \$544.00, at special unit prices.

Extra work order dated October 6, 1916, provided for stopping leak in canal prism and repairing gratings at upper ends of culverts at lock No. 17. Payment amounted to \$1,902.86, on a cost plus 15 per cent basis.

Extra work order dated November 9, 1916, provided for repairs to concrete stairway, lock No. 17; change of gearing on lower gate of lock No. 17, to reduce speed of operation; chipping concrete at end of lower approach wall, lock No. 17, to provide support for timber walks leading to cribs. Under a partial estimate on a cost plus 15 per cent basis \$1,845.56 has been paid.

Extra work order dated December 4, 1916, provides for the placing of concrete tops on the nine cribs below lock No. 17, together with board walks and snubbing-posts; for the placing of approximately 600 feet of guard-rail along the vertical wall at Little Falls; for the placing of additional riprap in the vicinity of lock No. 16. Cost estimate at contract prices is \$9,116.70. No payments have been made up to June 30, 1917.

Contract work was finished at the close of the fiscal year, June 30, 1917, with the exception of the removal of the buildings at Indian Castle and a small amount of work to be done under the extra work order of December 4, 1916.

Contract work from June 30, 1916, to June 30, 1917, was done as follows:

*At Mindenville.* A Lidgerwood excavator was placed on the northwest approach wall of lock No. 16. Spoil was placed on the canal bottom in front of the wall by dump-scows and was rehandled by the Lidgerwood machine to a spoil area north of the wall. This work progressed from June 30 to November 11, 1916. Work was resumed on April 26, 1917, in order to remove spoil left above grade, and on the completion of this work it was permanently shut down.

A small derrick-boat removed the lock stone of old lock No. 34 from the spoil area on the south side, a few hundred feet west of the Mindenville bridge over the canal, and placed this stone as riprap on the south canal slope, opposite the place where it was spoiled. This work was completed on August 11, 1916.

A large derrick-boat with a 90-foot steel boom began excavating on September 29, 1916, at the upper end of lock No. 16 on the north side. By means of its long boom it placed the material directly in a spoil area on the north side of the north embankment. It continued this work until November 22, 1916, when it was moved east of lock No. 16 to remove a bar. It was then dismantled and on November 27 was shipped from the contract.

Water was drawn from the canal prism on May 7, 1917, when the contractor removed by hand material from a few places above grade, extending over and about one-quarter mile of prism westward from the upper end of lock No. 16.

During May, 1917, third-class riprap was placed on the north bank, east of lock No. 16, under an extra work order.

*Between Mindenville and Indian Castle.* A derrick-boat with Fogarty bucket made the final prism excavation from Mindenville to the Acme gravel plant, between July 1 and November 1, 1916. It was then used to remove high places in the canal between the Mindenville bridge and lock No. 16 and was shut down on November 30, 1916.

The head-wall at the north, or outlet end of the dive culvert, nearly three miles west of Mindenville, was completed during August, 1916. The remainder of the culvert was built during the preceding winter.

Part of the canal prism between high, or Smith bridge and a point at least one-quarter mile easterly was not completed during the winter of 1915-1916. This work was done during October, 1916, by the dipper-dredge *St. Johnsville*.

*At Indian Castle.* The dipper-dredge *St. Johnsville* began the removal of the refill between the land-cut near Rocky Rift dam and the Indian Castle guard-gates, including Castle creek entrance, on August 28, 1916. Spoil was removed in dump-scows to a spoil area in the river west of the Rocky Rift dam. This work was completed in November, 1916.

About 400 feet of the tow-path a short distance west of Indian Castle was removed by a 16-ton Bucyrus steam-shovel. Work was begun on August 22 and completed on September 5, 1916.

The Indian Castle aqueduct over Castle creek was removed during 1916 and the stone used for riprap and wash wall.

About 4,300 cubic yards of wash wall were placed, being distributed at a large number of points along the canal. This work was completed in November, 1916.

*At Little Falls.* At the end of the fiscal year, June 30, 1916, considerable rock excavation remained to be done in the east approach to lock No. 17. The plant used consisted of the dipper-dredge *St. Johnsville*, the derrick-boat with 90-foot steel boom and two drill-boats. This work was completed on September 14, 1916. Work was then begun on the timber cribs with concrete tops and connecting walks, to form an approach wall. All of the nine cribs were placed by November 30, 1916, when work was shut down for the winter. Work on the concrete tops and walk was begun in April, 1917, and was completed on May 31, 1917.

Side-pond valves and equipment for lock No. 17 were provided under alteration No. 3. The concrete valve-wells were finished in June, 1916, and the valve equipment was completed in August, 1916.

Work at the westerly end of the contract was completed during October, 1916. It consisted of completing the dry retaining wall near old lock No. 39, together with the gravel lining on Southern avenue extension and Bellinger street. The prism refill west of the Little Falls guard-gates was removed by a derrick-boat and the prism excavation at old lock No. 39 was completed by the dipper-dredge *St. Johnsville* during September, 1916.

Additional gearing for reducing the operating speed of the lower gate of lock No. 17 was installed in April and was found to be satisfactory. This work was done under an extra work order.

The following table shows the contract and final estimate quantities with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$200	\$200	\$200	100.0	100.0
Excavation..... cu. yds.	921,900	108,891	911,929	11.8	99.0
Forming embankment..... cu. yds.	194,600	12,655	177,738	6.5	91.3
Lining..... cu. yds.	2,360	694	2,350	30.7	104.0
Puddle..... cu. yds.	470	85	510	18.0	108.5
Sawed lumber, yellow pine, ft. B. M.	23,000	9,411	23,239	40.9	101.0
Foundation piles..... lin. ft.	6,150	0	3,014	0.0	49.0
Second-class concrete..... cu. yds.	12,160	301.1	11,814.1	2.5	97.2

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Dry retaining wall.....cu. yds.	*1,060	73	900	6.9	84.8
Wash wall.....cu. yds.	34,720	4,208	30,871	12.1	89.0
Second-class stone paving...sq. yds.	350	20	168	5.7	48.0
Cobblestone paving.....sq. yds.	100	97	97	97.0	97.0
Second-class riprap.....cu. yds.	1,330	296	566	22.3	42.5
Third-class riprap.....cu. yds.	1,450	1,090	1,164	78.2	80.3
Fourth-class riprap.....cu. yds.	*6,780	1,333	6,590	19.7	97.2
Laying 48-inch cast-iron pipe and specials.....lbs.	313,145	0	313,145	0.0	100.0
12-inch vitrified pipe, laid...lin. ft.	80	0	0	0.0	0.0
Structural steel.....lbs.	12,127	1,641	4,815	18.5	39.7
Iron castings, plain.....lbs.	3,700	0	3,565	0.0	96.4
Wooden fence.....lin. ft.	4,400	52	2,009	1.2	45.6
Wooden fence, reset.....lin. ft.	1,660	0	1,696	0.0	102.8
Wrought-iron pipe railing...lin. ft.	100	0	0	0.0	0.0
Removing old bridge superstructures.....No.	3	2	3	66.7	100.0
Maintaining highway traffic, lump sum	\$750	\$75	\$750	10.0	100.0
Removing buildings.....No.	8	5	7	62.5	87.5
Coffer-dams, pumping, etc., lump sum	\$37,630	\$4,139 30	\$37,630	11.0	100.0
Setting coping stone.....lump sum	\$20	0	\$20	0.0	100.0
Steel sheet-piling.....sq. ft.	42,400	15	39,279	0.04	92.6
Moving and erecting change bridge.....lump sum	\$500	0	\$500	0.0	100.0
Side-pool valves and equipment, lock No. 17.....lump sum	\$16,953	\$3,306 97	\$16,953	49.0	100.0
Sawed lumber in cribs.....ft. B. M.	56,000	55,862	55,862	99.8	99.8
Stone filling in cribs.....cu. yds.	600	468	468	78.0	78.0
Gross estimate at contract prices..	*\$1,708,864 21	\$201,398 60	\$1,668,069 38	11.8	97.7
<i>Extra Work Orders</i>					
Aug. 20, 1914....special unit price	\$875 00		\$827 54		Finished
June 14, 1915...contract and special unit prices	5,730 53		5,782 61		Finished
Jan. 29, 1916...cost plus 15 per cent			5,189 08		Finished
Aug. 10, 1916....contract unit price	560 00		544 00		Finished
Oct. 6, 1916...cost plus 15 per cent			1,902 86		Finished
Nov. 9, 1916...cost plus 15 per cent			1,845 56		
Dec. 4, 1916....contract unit price	9,116 70				
Total.....			\$16,091 65		

\* Figures given include excess quantities authorized by the Canal Board, as follows:  
 Dry retaining wall, 600 cu. yds., by resolution dated June 29, 1916.  
 Fourth-class riprap, 3,000 cu. yds., by resolution dated April 27, 1915.  
 These quantities at the contract prices amount to \$10,080.00.

### Contract No. 122

This contract provided for the construction of the substructure, superstructure and approaches of a highway bridge over the Mohawk river (Barge canal prism) at about center line Sta. 4246 + 42, about a mile east of Little Falls. It was awarded to Thomas Leonard, being signed on February 23, 1916. On November 22, 1916, the contract was canceled by resolution of the Canal Board. The amount of the engineer's preliminary estimate was \$59,399.50, the contractor's bid \$56,615.00.

W. C. Benedict, Assistant Engineer, was in charge.



During July, August and September the fills for the northerly and southerly approaches were completed as far as practical until the abutments were completed. The excavation for the northerly abutment was partly done and some sheeting and timber placed to support the side of part next to the highway. A ditch was excavated through the tow-path west of the south approach of the new bridge, to drain the old canal between old lock No. 36 and the south approach. Gravel lining was placed on the greater part of the northerly approach and the concrete culvert under this approach was practically completed.

A 16-ton Bucyrus steam-shovel was used in the borrow-pit located on the south side of the river east of the suspension bridge, to load wagons with material for the approaches. This was practically the only machinery used on this contract. The other labor was performed by teams and men.

Contract work was suspended September 19, 1916, at which time, tools, material, etc., were removed from the site by wagons.

After the contract was canceled by resolution of the Canal Board on November 22, 1916, this office was directed to prepare an estimate of quantities for completing the work. This estimate was prepared and sent to Albany.

There were no extra work orders under this contract.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date.
Excavation..... cu. yds.	14,000	8,467	12,594	60.5	90.0
Lining..... cu. yds.	495	203	203	41.0	41.0
Second-class concrete..... cu. yds.	1,700	17	17	1.0	1.0
Fourth-class riprap..... cu. yds.	35	0	0	0.0	0.0
Cobblestone gutter..... sq. yds.	170	0	0	0.0	0.0
Sawed lumber..... ft. B. M.	51,500	0	0	0.0	0.0
Sheeting and bracing..... ft. B. M.	10,500	0	0	0.0	0.0
Wooden sheet-piling..... ft. B. M.	37,600	0	0	0.0	0.0
Foundation piles..... lin. ft.	4,930	0	0	0.0	0.0
Wooden fence..... lin. ft.	1,470	0	0	0.0	0.0
Structural steel..... lbs.	546,000	0	0	0.0	0.0
Oil signal-lamps..... No.	0	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$4,000	0	0	0.0	0.0
Removing existing buildings..... lump sum	\$50	0	\$25	0.0	50.0
Removing existing superstructures..... lump sum	\$800	0	0	0.0	0.0
Maintaining navigation..... lump sum	\$1	0	0	0.0	0.0
Maintaining highway traffic..... lump sum	\$1	0	0	0.0	0.0
Gross estimate at contract prices.....	\$56,615 00	\$4,209 10	\$6,091 25	7.4	10.8

*Contract No. 122-A*

This contract is for constructing the substructure and superstructure, and completing the approaches of a highway bridge over the Mohawk river (Barge canal prism) at about center line Sta. 4246+42, near Little Falls. It was awarded to Chesley, Earl & Heimbach of Buffalo, N. Y., being signed on March 8, 1917. The engineer's preliminary estimate was \$52,717.00, and the contractor's bid, \$67,053.16. This contract provides for completing the work which was left unfinished under contract No. 122, when that contract was canceled by the Canal Board on November 22, 1916.

W. C. Benedict, Assistant Engineer, is in charge.

On April 21, 1917, the contractor began work on the north side of the river by making a detour to the south around the abutment and placing a temporary guard-rail along the south edge.

A large pile-driver with 45-foot leads was erected west of the north abutment and began driving sheeting and foundation piles for this structure. Before June 30, 1917, the foundation piles for the north abutment were completed, the excavation finished and about 375 cu. yds. of concrete placed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation..... cu. yds.	3,700	134	3.6
Lining..... cu. yds.	340	0	0.0
Second-class concrete..... cu. yds.	1,680	215	12.8
Fourth-class riprap..... cu. yds.	35	0	0.0
Cobblestone gutter..... cu. yds.	110	0	0.0
Sawn lumber..... ft. B. M.	\$1,500	0	0.0
Sheeting and bracing..... ft. B. M.	16,500	7,463	71.1
Wooden sheet-piling..... ft. B. M.	37,999	0	0.0
Foundation piles..... lin. ft.	4,930	1,760	35.7
Wooden fences..... Ea. ft.	1,410	0	0.0
Structural steel..... lbs.	546,000	0	0.0
Oil signal-lamps..... No.	6	0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$10,000	0	0.0
Removing existing building..... lump sum	\$50	0	0.0
Removing existing superstructure..... lump sum	\$100	0	0.0
Maintaining navigation..... lump sum	\$300	0	0.0
Maintaining highway traffic..... lump sum	\$260	0	0.0
Gross estimate at contract prices.....	\$67,053.10	\$3,283.69	4.8
<i>Extra Work Order</i>			
April 4, 1917..... cost plus 13 per cent			

ing of the Utica & Mohawk Valley railway bridge; permits use of second-class concrete for stone paving at Frankfort retaining dam and at stream entrances; increases length of wooden sheet-piling and provides lining under riprap at Frankfort retaining dam. Contract quantities then amounted to \$2,681,761.12, a decrease of \$1,657.00.

Alteration No. 12, approved by the Canal Board December 4, 1914, provides for eliminating fourth-class riprap underpinning wash wall east of Herkimer guard-gate and for eliminating the raising of the Washington street bridge. Contract quantities then amounted to \$2,636,511.12, a decrease of \$45,250.00.

Alteration No. 13, approved by the Canal Board February 23, 1915, provides for placing fourth-class riprap for underpinning slope wall between Stas. 4650 + 72 and 4687. Contract quantities then amounted to \$2,645,111.12, an increase of \$8,600.00.

Alteration No. 14, approved by the Canal Board October 6, 1915, provides for additional bank protection between Little Falls and Jacksonburg and for riprap below Frankfort dam. Contract quantities then amounted to \$2,698,761.12, an increase of \$53,650.00.

Alteration No. 15, approved by the Canal Board June 14, 1916, provides for driving steel sheet-piling in the north embankment just west of lock No. 18. Contract quantities then amounted to \$2,751,261.12, an increase of \$52,500.00.

Additional work to the value of \$1,956.59 was done under six extra work orders, as follows:

Extra work order dated April 29, 1912, provided for removing the Casey & Murray coffer-dam at the east end of contract No. 30. Payment amounted to \$829.63, on a cost plus fifteen per cent basis.

Extra work order dated November 13, 1912, provided for replacing ladder in valve-well, chipping south lower lock gate, painting white oak, all at lock No. 18. Payment amounted to \$136.02, on a cost plus fifteen per cent basis.

Extra work order dated June 20, 1913, provided for coating needles at dam No. 14 with two coats of preservative. Payment approved March 1, 1917, amounted to \$228.68, at special unit price.

Extra work order dated September 30, 1913, provided for resetting iron railing on new walls of the north and south approaches of the Mohawk street bridge, Herkimer. Payment amounted to \$87.57, on a cost plus fifteen per cent basis.

Extra work order dated November 25, 1913, provided for placing second-quality steel piling and metal reinforcement in the south pier of Washington street bridge. Payment amounted to \$474.69, at contract unit prices.

Extra work order dated March 10, 1914, provided for transporting and placing five lengths of cast-iron pipe from Ilion to Little Falls. Payment amounted to \$200.00, on a lump sum basis.

With the exception of the work under alteration No. 15, comparatively little remained to be done on this contract after June 30, 1916.

Some difficulty was experienced in cleaning, or sweeping the prism between Little Falls and lock No. 18. For this entire length the bottom of the prism was strewn, more or less thickly, with water-soaked logs and trees. Also, in the rock cut at the easterly end of the contract, where the work had been done partly in the dry and the excavation carried to grade or only a few tenths below, and where the adjoining rock had been drilled in the wet with a drill-boat and the blasted rock removed with a dipper-dredge, it was found, when this part of the prism was swept, that there were many yards of rock in various sized pieces scattered over the bottom of the prism, which once had been finished. Some of the rock was removed with a specially-constructed flat-nosed dipper without teeth. Another device which was used consisted of an old dipper-dredge handle suspended horizontally from the bow of a derrick-boat, the boat being towed backwards by means of tugs. The position of the handle was adjusted with the aid of the derrick on the boat, so that its bottom could be kept always at grade. On account of the great weight of the handle, any loose stone or other material would be carried along until it was moved into a hole below grade. This arrangement was used to complete the sweeping of the channel, as it proved much more satisfactory than the sweep used on other parts of the contract, which consisted of a series of 1 by 6-inch steel bars, 20 feet long, spaced

one foot apart and supported at the upper ends. These bars swung freely when the prism was clear to grade. However, they only located the high spots or loose rock, while the dipper handle permanently removed them.

The rock-spoil bank protection was placed by means of an ordinary derrick-boat and steel skips. This rock spoil was removed from the prism to the skips with a dipper-dredge. A very little hand work was done in certain places to bring the protection even with the top of the new bank.

The 35-foot steel sheet-piling driven near the front angle in the north embankment above lock No. 18 was driven in the usual way with a steam pile-driving outfit. The work was started early in July, 1916, and the one thousand feet of bank finished in August, 1916.

The embankment on the south side of the prism about three-quarters of a mile westward from lock No. 18 was raised to grade with wheelbarrows, the material being taken from spoil back of the embankment.

Some work was done west of Washington street bridge on the south bank. By means of a tower and drag-line bucket the gravel at the top of the bank was moved down over the clay above water, thereby making the finished slope flatter.

The heavy stone delivered at various localities below Fort Herkimer and Mohawk for wash wall and riprap, but never used, was transported to a storage pile at Mohawk by means of scows and a derrick-boat.

A small slide occurred on the north embankment, or old tow-path, about 1,800 feet east of Washington street bridge. Repairs were made by teams and wagons, which placed material taken from spoil back of the old tow-path. Stone protection was placed on the front by a derrick-boat.

At Fulmer creek stream entrance, a short distance west of the Herkimer guard-gates, repairs were made to a small section of the concrete, which had been undermined.

The 20-inch hydraulic dredge *DeWitt Clinton* removed a bar from the north side of the prism extending from the Frankfort highway bridge easterly about 1,000 feet. This bar was formed during the past season mostly from material which was washed

from the river bank opposite the Frankfort retaining dam, caused, no doubt, by the increased current due to the contracted spillway of the dam. The remainder of this bar was pumped to spoil on the south side of the prism.

This dredge also removed some refill from the approach to the Frankfort terminal.

Heavy riprap was placed in front of the Frankfort retaining dam after the slope of the bank had been flattened. This work was completed in August, 1916.

The contract was accepted by resolution of the Canal Board, September 21, 1916.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$1,000	0	\$1,000	0.0	100.0
Grubbing..... cu. yds.	31,000	221	30,613	0.7	96.8
Excavation..... cu. yds.	5,482,671	279,072	6,223,307	5.1	113.5
Sheeting and bracing..... ft. B. M.	106,000	0	20,955	0.0	19.8
Round-timber bracing..... lin. ft.	*3,000	0	1,965	0.0	65.5
Forming embankment..... cu. yds.	569,270	9,545	546,748	1.7	96.0
Lining..... cu. yds.	5,994	201	5,479	3.4	91.4
Puddle..... cu. yds.	300	1	142	0.3	47.3
Sawed lumber..... ft. B. M.	104,300	1,212	87,372	1.2	83.8
Sawed lumber in lock needles..... ft. B. M.	19,000	0	21,470	0.0	113.0
White oak sawed lumber in miter-mills and lock-gates..... ft. B. M.	9,000	0	8,839	0.0	96.2
Foundation piles..... lin. ft.	41,762	78	45,145	0.2	108.1
Wooden sheet-piling..... ft. B. M.	730,000	4	583,449	0.0	79.9
First-quality steel piling..... sq. ft.	43,820	37,251	46,471	85.0	106.0
Second-quality steel piling..... sq. ft.	110,000	0	0	0.0	0.0
Second-class concrete..... cu. yds.	38,817	4.8	35,727.8	0.0	92.0
Third-class concrete..... cu. yds.	130	0.6	129.6	0.5	99.7
Second-class reinforced concrete..... cu. yds.	746	4.9	732.9	0.7	96.2
First-class masonry coping..... cu. yds.	*9.5	0.06	8.22	0.6	86.5
Dry retaining wall..... cu. yds.	5,540	63	4,397	1.1	79.4
Wash wall..... cu. yds.	45,860	830	35,798	18.1	78.1
Second-class stone paving..... sq. yds.	240	3	248	0.9	72.9
Third-class stone paving..... sq. yds.	663	1	555	0.2	83.7
Cobblestone paving..... sq. yds.	410	17	404	4.1	96.6
First-class riprap..... cu. yds.	1,290	0	1,033	0.0	80.1
Second-class riprap..... cu. yds.	*5,030	676	5,025	13.4	99.9
Third-class riprap..... cu. yds.	2,124	453	1,967	22.7	92.1
Fourth-class riprap..... cu. yds.	14,624	1,070	13,704	7.3	93.7
Structural steel..... lbs.	1,034,050	13,800	1,012,658	1.3	97.9
Metal reinforcement..... lbs.	76,680	4	71,688	0.0	93.6
Iron castings, plain..... lbs.	33,800	0	30,345	0.0	89.8
Iron castings, machined..... lbs.	9,860	0	8,820	0.0	89.5
Metal in lock-gates..... lbs.	260,000	5,690	239,976	2.2	92.3
Metal in buffer-beams..... lbs.	90,000	0	92,798	0.0	103.1
Metal in lock-valves..... lbs.	35,000	46	33,158	0.1	94.7
Metal in guard-gates..... lbs.	360,000	6,118	353,078	1.7	96.1
Wood-block pavement..... sq. yds.	300	1	279	0.3	93.0
Wooden pavement, 3½ in. thick..... sq. yds.	620	1	596	0.1	96.0
Wooden fence..... lin. ft.	3,294	1	2,340	0.0	71.0
Lattice railing..... lin. ft.	1,044	1	1,044	0.1	100.0
Storehouses..... No.	2	0	2	0.0	100.0
Office buildings..... No.	3	0	1	0.0	33.3

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Crab..... No.	1	0	1	0.0	100.0
Repainting old masonry..... lin. ft.	18,900	0	14,347	0.0	75.9
Maintaining highway traffic..... lump sum	\$5,000	0	\$5,000	0.0	100.0
Maintaining navigation..... lump sum	\$500	\$100	\$500	20.0	100.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$17,000	\$5,400	\$17,000	30.0	100.0
Deduct for bridge superstructures, removed, lump sum	\$500	0	\$500	0.0	100.0
Deduct for buildings, removed..... lump sum	\$700	0	\$700	0.0	100.0
Additional coffer-dams, pumping, bailing and draining..... lump sum	\$17,000	0	\$17,000	0.0	100.0
Concrete paving blocks..... sq. yds.	3,350	11	2,640	0.2	84.8
Rock-spoil bank protection..... cu. yds.	31,000	5,209	27,962	16.8	90.2
Gross estimate at contract prices.....	\$2,764,018 02	\$172,792 42	\$2,311,229 60	5.8	105.7
<i>Extra Work Orders</i>					
April 29, 1912..... cost plus 15 per cent	\$330 00		\$329 06		Finished
Nov. 13, 1912..... cost plus 15 per cent	140 00		136 02		Finished
June 20, 1913..... special unit price	200 62		228 68		Finished
Sept. 20, 1913..... cost plus 15 per cent			87 57		Finished
Nov. 25, 1913..... contract unit price	636 00		474 69		Finished
Mar. 10, 1914..... lump sum	200 00		200 00		Finished
Total.....			\$1,956 59		

\* Figures given include excess quantities authorized by the Canal Board, as follows:

Round timber bracing, 2,600 lin. ft., by resolution dated Dec. 11, 1912.

First-class masonry coping, 4 cu. yds., by resolution dated Jan. 26, 1915.

Second-class riprap, 670 cu. yds., by resolution dated June 6, 1917.

These quantities at the contract prices amount to \$2,757.50.

### Contract No. 30-A

This contract provides for completing the construction of the improved Erie canal at its intersections with the old Erie canal, and incidental work, between Jacksonburg and Herkimer. It was awarded to E. Brown Baker of Herkimer, N. Y., being signed on November 24, 1916, and was assigned to the Mohawk Dredge and Dock Company, Inc., of Herkimer, N. Y., on March 26, 1917. Work was begun on November 24, 1916. The engineer's preliminary estimate was \$122,013.00, the contractor's bid, \$128,182.00.

C. G. Ranney, Assistant Engineer, is in charge.

Work was begun at the easterly intersection, near old Erie canal bridge No. 141, on November 24, 1916, while the water was still in the old canal. Material was excavated from the prism with the dredge *General Herkimer*, operating as a dipper-dredge, and cast to the north, mostly within the limits of the embankment. The grubbing across the old canal channel under the north embankment was done with the dredge, the material being loaded in bottom-dump scows, which were towed to wide water to the east

and dumped in a previous borrow-pit. As soon as the grubbing was completed, the dredge cast material from back of the embankment and from the prism to within the embankment limits, bringing the embankment to the water-surface of the old canal.

A steam pile-driver was then installed and the two-inch triple-lap sheet-piling driven across the old canal channel. The pile-driving outfit consisted of a steam-hammer with swinging leads, which were supported from the 75-foot boom of a derrick-boat of 15 tons capacity.

On account of water conditions it was found necessary to drive a pile at each end of a pair of heavy timbers, which were bolted on each side of the piles. These timbers served as a rest for the leads, which were fitted with pins driven into the timbers to hold the leads in place. These timbers were used also as a runway for the men and as a guide to keep the piles in line and prevent twisting. The finishing of the prism in this vicinity was done in May and June, 1917, with the *General Herkimer*, used as a hydraulic dredge. The material from the prism was pumped from the prism excavation to the embankment area. Afterwards a traveling derrick rigged with a drag-line and bucket hauled the material back into place, sloping the embankment. The embankment and prism are completed at this location, except trimming for and placing the wash wall.

The intersection near old lock No. 41 was begun the latter part of November with a traveling derrick, which did the necessary grubbing from the old tow-path to the easterly end of the new embankment constructed under contract No. 30. It also built levees on the front and back area of the embankment for the hydraulic dredge work. Two pile-driving outfits, consisting of a steam-hammer and a drop-hammer, were used to drive the quarter-inch steel sheet-piling across the branch of the old river channel. A derrick was set up on the berme side of the old canal near the back angle of the new embankment and part of the prism excavation made with a grab-bucket, the material being cast in the old canal channel as embankment and spoil. Completing the prism excavation and filling between the levees was done early this spring by the dredge *General Herkimer*. The embankments were brought to grade with a traveling derrick rigged with a drag-



line and bucket, working from the top of the bank, and with derrick-boats cleaning the side of the prism. The excavation and embankment in this locality are complete except trimming for and placing the wash wall.

The excavation for the intersection at the upper end of the Fort Herkimer island was done this spring with the Eastover Construction Company's 20-inch hydraulic dredge No. 91. This excavation was spoiled in the old canal prism easterly from the prism of the Barge canal. The slopes were trimmed with a derrick-boat and drag-bucket. This connection is complete except for cleaning prism and trimming the embankment. A small part of the wash wall has been placed.

The greater part of the underpinning of the old slope wall east of Washington street bridge was done previous to the opening of navigation.

The Eastover Construction Company's 20-inch hydraulic dredge excavated a 50-foot channel east of the Mohawk guard-gate. Later it excavated for the riprap underpinning, the placing of the stone for which was done with a derrick-boat. The work in this vicinity was only partially completed on June 30, 1917.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing.....lump sum	\$100	\$75	75.0
Excavation.....cu. yds.	93,620	66,346	70.8
Forming embankment.....cu. yds.	30,100	22,214	73.8
Wooden sheet-piling.....ft. B. M.	68,000	60,326	88.7
Steel sheet-piling.....sq. ft.	19,800	4,347	44.4
Second-class concrete.....cu. yds.	270	0	0.0
Wash wall.....cu. yds.	4,430	1,058	23.9
Fourth-class riprap.....cu. yds.	3,500	1,059	30.2
Gross estimate at contract prices.....	\$128,182 00	\$79,617 35	62.1

† Partly contingent.

### Contract No. 133

This contract provides for the construction of a junction lock in the present Erie canal near its junction with the Barge canal

at Mohawk. It was awarded to Morrison & Quinn, Inc., of Rochester, N. Y., being signed on October 16, 1916. The engineer's preliminary estimate was \$47,534.00; the contractor's bid was \$48,638.80.

The engineering work on this contract was in charge of C. A. Curtis, Assistant Engineer, from the beginning of work until June 13, 1917. The completion of the work and the preparation of the final account has been in charge of H. W. Jewell, Junior Assistant Engineer.

Extra work order dated March 22, 1917, provided for a cut-off of steel sheet-piling at the upper end of the lock. Payment made June 1, 1917, amounted to \$569.88, at special unit prices.

Work was begun on this contract about December 18, 1916. The work done was the driving of 2-inch triple-lap, wooden sheet-piling 13 feet long for sheeting and bracing along the back of the foundation of the south lock wall. About the same time, the construction of a small dam above the limits of the contract and also one beyond the ends of the lower return walls of the lock were under way.

At the northerly end of the lower coffer-dam there was placed in a temporary house a 140-hp. upright boiler, one 10-inch centrifugal steam-pump, one 6-inch centrifugal steam-pump and one 3-inch duplex pump. The boiler and pumps were used to drain the lock site.

The sheeting and bracing was driven by two drop hammers, one weighing 2,000 pounds and the other, 2,100 pounds. One pile-driver with swinging leads suspended from a guy derrick and one with stationary leads 18 feet long and a Vulcan steam-hammer were used to drive the inside sheet-piling and the foundation piles.

The excavation was done by a guy derrick with a 63-foot boom and a 45-foot mast operated by a 20-hp. boiler and 4-drum engine equipped with a one-yard clam-shell bucket. The derrick and hoisting engine were located on the south side of the Erie canal prism and just east of the New York State Railway bridge over the canal and did the excavating for the easterly end of the lock

chamber, etc. A part of this excavation was stored on the south side of the prism, to be used for backfill, or embankment, and the remainder was loaded from the bucket to wagons and spoiled several hundred feet easterly along the highway. The excavating of the remainder of the lock chamber was done by a traveling derrick with an A frame, of 10 tons capacity and having a 12-hp. boiler with drag-line and Page bucket. The excavated material was loaded in dump-wagons and spoiled west of the West Shore Railroad bridge over the Erie canal. The lower approach to the lock was excavated by a dredge equipped with a small clam-shell bucket, which was rented from the State Superintendent of Public Works. Some of this excavated material was placed in scows and spoiled in a river spoil area and the remainder was placed on the south side of the lock approach and used for embankment.

The concrete for the lock was mixed by two concrete mixers of 22 cubic feet capacity, equipped with 8-hp. upright boilers. One mixer was placed near the guy derrick and the other on the street near the south end of the highway bridge. The concrete was conveyed from the mixers to the various parts of the work through metal troughs and to the wing-walls by wheelbarrows.

The embankment or backfill was made by the guy derrick used for the excavation and by wheel-serapers and wheelbarrows.

On June 30, 1917, the work remaining to be done to complete the contract was a small amount of excavation at each end of the contract, a small amount of concrete in the southwest wing-wall, the embankment at the upper end of the lock, the removal of some plant and the general clearing and cleaning up for acceptance.

The lock was open for navigation early in June.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	10,250	5,108	49.8
Sewed lumber, yellow pine or Douglas fir.....ft. B. M.	10,200	10,739	105.3
Forming embankment.....cu. yds.	3,800	1,935	50.9
Foundation piles.....lin. ft.	12,800	8,406	65.7
Wooden sheet-piling.....ft. B. M.	94,500	20,045	21.2
Second-class concrete.....cu. yds.	3,390	3,097	93.8
Structural steel.....lbs.	4,200	4,300	102.4
Iron castings, plain.....lbs.	7,600	5,200	68.4
Iron castings, machined.....lbs.	5,900	4,763	80.8
Coffer-dams, pumping, bailing and draining.....lump sum	\$2,500	\$1,800	72.0
Sheeting and bracing.....ft. B. M.	44,000	28,280	64.2
Gross estimate at contract prices.....	\$48,635 90	\$38,621 26	75.7
<i>Extra Work Order</i>			
Mar. 22, 1917.....special unit price	\$485 00	\$509 88	Finishes d

#### Contract No. 29-A

This contract provides for completing the construction of the canal within the limits of contract No. 29. It extends from the westerly limits of contract No. 30, one-half mile east of Sterling creek, westward to the Herkimer-Oneida county line, a distance of 4.0 miles. The contract was awarded to the Eastover Construction Company, Inc., being signed on March 27, 1916. Work was started early in April, 1916. The Engineer's preliminary estimate was \$162,005.00, the contractor's bid, \$185,106.50. The contract price as modified by alterations Nos. 1 to 5, inclusive, is \$318,659.70.

B. T. Kenyon, Assistant Engineer, is in charge.

The alterations on this contract are as follows:

Alteration No. 1, approved by the Canal Board June 14, 1916, provides for substituting second-class concrete for certain paving and riprap, for furnishing additional stone for wash wall and riprap, and for eliminating certain stone protection at various points. It increases the contract price by \$11,503.20.

Alteration No. 2, approved by the Canal Board August 31, 1916, provides additional wooden sheet-piling in canal banks and for substituting "Removing and replacing concrete" for "Finishing concrete surfaces." It increases the contract price by \$2,460.00.

Alteration No. 3, approved by the Canal Board March 1, 1917, provides for driving wooden sheet-piling in the south bank of the canal from Sta. 5215 to Sta. 5228+75 and for placing wash wall on banks at various localities. It increases the contract price by \$50,042.00.

Alteration No. 4, approved by the Canal Board April 2, 1917, provides for building a new concrete spillway at Day's. It increases the contract price by \$17,438.00.

Alteration No. 5, approved by the Canal Board June 27, 1917, provides for placing additional wash wall along the canal banks at various localities. It increases the contract price \$52,110.00.

Extra work orders under contract No. 29-A are as follows:

Extra work order dated June 25, 1917, provides for repairing the banks which were washed out by the heavy rains during the week of June 11, 1917, in order to restore navigation at the earliest possible date. Payment basis is cost plus fifteen per cent. Up to June 30, 1917, no payments for work done have been made.

Contract work done during the fiscal year is as follows:

During the year the prism excavation has been done to full width and depth from the Herkimer-Oneida county line to lock No. 19, and a channel for boats of 8 feet draft from lock No. 19 to the easterly end of the contract ( $\frac{1}{2}$  mile). This dredging was done by the 20-inch hydraulic dredge *Utica*, the 20-inch hydraulic dredge *DeWitt Clinton* and the 16-inch hydraulic dredge *General Herkimer*. The excavated material was placed in spoil areas adjacent to the prism. A small amount was used to complete embankments, etc.

The stream entrances at Budlong creek, Wood creek and Knapp brook have been completed. A guy derrick with grab-bucket and skips was used to do the excavation and place the concrete, riprap and paving.

With the exception of a small amount of trimming of embankment on both sides of the prism, the work on Day culvert has been completed. A steam-hammer was used to drive the piles and a guy derrick with grab-bucket and skips was used to do the excavation and place the concrete. A half-yard Haines mixer was used to mix the concrete.

The work connected with the finishing of the Sterling creek stream entrance has been completed.

The excavation above and below the Sterling creek dam and for the bank protection, concrete apron, wash wall, etc., and the sloping of the banks, was done with a traveling derrick and a guy derrick with grab-bucket, which moved the material into the water, where it was moved to a permanent spoil area by the hydraulic dredge. The concrete was mixed by a Milwaukee concrete mixer with gasoline engine. The concrete and riprap were placed with a guy derrick and skips. The necessary pumping was done by a six or eight-inch centrifugal pump, with engine.

The Sterling creek spillway is complete. The excavating and riprapping were done with the McMyler excavating machine, with bucket. The excavated material was moved into the prism, where it was rehandled by the hydraulic dredge.

At lock No. 19 and guide walls the grading and fill north of the lock have been made, snubbing-posts set, walks placed on gates and the embankment made from the upper end of the lock to the N. Y. C. & H. R. R. R. tracks. The filling back of the lock walls was done with a Model 20, Marion steam-shovel, which loaded 4-yd. dump cars that were hauled with a team to the fill. The work on the south side of the lock was practically all done by teams and hand labor.

On account of early spring flood conditions the river broke through the embankment below lock No. 20, overflowing the prism between locks Nos. 20 and 19 and causing the concrete core wall at Day spillway to fail. As soon as possible a coffer-dam was placed across the spillway. The reconstruction of this spillway is authorized under alteration No. 4.

Heavy rains and a cloudburst, which occurred on June 11, 1917, carried so much water into the canal as to cause the uncompleted bank on the south side west of Burch culvert to fail in two places. A depth of five or six feet of the bank for a length of about 100 feet was washed away. Day spillway was ineffective, because of the coffer-dam. Repairs were made at once under the extra work order mentioned above, that of June 25, 1917.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$300	0	0	0.0	0.0
Excavation..... cu. yds.	376,080	290,053	305,087	77.1	81.1
Sheeting and bracing..... ft. B. M.	45,000	16,730	39,730	37.2	86.0
Forming embankment..... cu. yds.	70,300	61,896	62,067	88.0	88.3
Cinder filling..... cu. yds.	3,300	0	0	0.0	0.0
Lining..... cu. yds.	683	38	97	5.6	14.2
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	31,300	580	580	1.9	1.9
Foundation piles..... lin. ft.	10,300	2,386	3,010	23.2	29.2
Wooden sheet-piling..... ft. B. M.	387,000	137,460	137,400	35.5	35.5
Steel sheet-piling..... sq. ft.	1,000	0	0	0.0	0.0
Second-class concrete..... cu. yds.	2,600	914	928	35.2	35.6
Second-class reinforced concrete..... cu. yds.	680	484	647	71.2	95.1
Removing and replacing defective concrete, cu. yds.	2,550	0	0	0.0	0.0
Finishing concrete surfaces..... sq. ft.	290	127	127	63.5	43.5
Laying wash wall..... cu. yds.	400	235	404	58.8	101.0
Laying first-class stone paving..... sq. yds.	*292	0	234	0.0	97.2
Furnishing and laying third-class riprap, cu. yds.	3,822	2,666	3,162	69.6	82.6
Laying third-class riprap..... cu. yds.	1,268	366	866	44.6	68.3
Structural steel..... lbs.	2,020	0	0	0.0	0.0
Metal reinforcement..... lbs.	16,800	4,292	5,117	27.2	32.4
Iron castings, plain..... lbs.	8,100	4,875	4,875	60.2	60.2
Wooden fence..... lin. ft.	1,380	0	0	0.0	0.0
Removing existing flooring..... ft. B. M.	16,000	0	0	0.0	0.0
Maintaining highway traffic..... lump sum	\$100	0	0	0.0	0.0
Storehouse..... lump sum	\$600	0	0	0.0	0.0
Coffer-dams, pumping, etc..... lump sum	\$2,000	\$1,248	\$1,600	62.4	80.0
Cleaning up site of contract, removing plant and debris..... lump sum	\$1,500	\$750	\$750	50.0	50.0
Furnishing and laying wash wall..... cu. yds.	27,230	290	300	0.7	0.7
Additional coffer-dams, pumping, etc., lump sum	\$3,875	\$635.77	\$635.77	17.3	17.3
Deduct for sheeting and bracing, reused, ft. B. M.	0	10,900	23,000	0.0	0.0
Gross estimate at contract prices.....	*\$318,784.70	\$147,755.19	\$159,382.96	46.3	50.0
<i>Extra Work Order</i>					
June 25, 1917..... cost plus 15 per cent					

\* Figures given include excess quantity authorized by the Canal Board, as follows:  
Laying first-class stone paving, 125 cu. yds., by resolution dated Sept. 7, 1910.  
This quantity at the contract price amounts to \$125.00.

### Contract No. 158

The portion of the contract affecting this residency provided for furnishing and delivering at Herkimer 3 red and 6 black burys, 14 red and 24 black lamp posts, and 200 feet of mooring cable. The contract was awarded to James McKinney & Son of Albany, N. Y., being signed March 22, 1917. The engineer's preliminary estimate for this portion of the contract amounted to \$865.00, and the contractor's bid, to \$728.65.

This contract was accepted by the Canal Board and the final estimate approved June 22, 1917, the amount being the same as the contractor's bid.

C. G. Ranney, Assistant Engineer, had charge of this contract. The materials have all been delivered.

The following table shows the contract and final estimate quantities, with percentages: .

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
Barrel buoys, complete.....No.	50	50	100.0
Mooring cable.....lin. ft.	1,200	1,200	100.0
Lamp-posts, complete.....No.	74	74	100.0
Gross estimate at contract prices.....	\$3,127 00	\$3,127 00	100.0

#### *Contract No. 153*

The portion of the contract affecting this residency provided for furnishing and delivering at Herkimer 38 red and 45 black oil-burning lanterns for buoy, stake and bridge lights. The contract was awarded to R. B. Wing & Son of Albany, N. Y., being signed on February 28, 1917. The engineer's preliminary estimate was \$12.00 per lantern, or \$996.00 for the part in this residency. The contractor's bid was \$12.54 per lantern, or \$1,040.80 for this portion of the contract.

C. G. Ranney, Assistant Engineer, had charge of this contract.

The lanterns have all been delivered and are being tested prior to acceptance.



*Construction Work — Barge Canal*

The Barge canal work done on section 4 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE								
	Contract No. 13 (section 4)	Contract No. 18	Contract No. 18-A	Contract No. 20-A	Contract No. 29	Contract No. 29-A	Contract No. 30	Contract No. 30-A	Contract No. 31
1907.....		\$76,430							
1908.....		212,490							
1909.....		92,490			\$30,410				\$284,050
1910.....	\$9,170	74,610		\$41,730	136,350		\$212,880		191,390
1911.....	762	20,959		77,700	166,890		691,490		187,520
1912.....				179,990	117,460		615,790		81,080
1913.....				21,271	32,000		427,100		7,302
1914.....			\$205,320		14,990		321,610		
1915.....			932,790				289,780		
1916.....			328,590			\$11,620	176,790		
1917.....			201,389			147,760	172,800	\$79,610	
Totals.....	\$9,932	\$476,979	\$1,668,059	\$320,691	\$478,120	\$159,380	\$2,911,230	\$79,610	\$751,342

Extra Work Orders Paid, 1907-1917, Inclusive								
1907.....		\$378						
1908.....		9,532						
1909.....		2,274						\$451
1910.....		7,422						175
1911.....								876
1912.....				\$200	\$5,535		\$830	561
1913.....				600	1,890		136	
1914.....					957		762	
1915.....			\$6,610					
1916.....			9,432				229	
1917.....								
Totals.....		\$19,603	\$16,072	\$309	\$3,382		\$1,937	\$2,063

YEAR*	VALUE OF WORK DONE							Totals
	Contract No. 87	Contract No. 92 (section 4)	Contract No. 107	Contract No. 122	Contract No. 122-A	Contract No. 133	Contract No. 158 (section 4)	
1907.....								\$76,430
1908.....								212,490
1909.....								406,950
1910.....								666,130
1911.....								1,148,321
1912.....								994,310
1913.....	\$7,100		\$4,380					499,173
1914.....	4,300	\$39,980	108,160					744,360
1915.....		40,710	2,121					1,265,391
1916.....		1,705		\$1,880				520,875
1917.....				4,210	\$3,230	\$36,820	\$729	646,548
Totals.....	\$11,400	\$132,395	\$114,661	\$6,090	\$3,230	\$36,820	\$729	\$7,180,678

Extra Work Orders Paid, 1907-1917, Inclusive							
1907.....							\$378
1908.....							9,532
1909.....							2,725
1910.....							7,597
1911.....							7,441
1912.....							3,187
1913.....							1,844
1914.....			\$125				8,380
1915.....		\$1,463	307				10,281
1916.....						\$570	
1917.....							
Totals.....		\$1,463	\$432			\$570	\$51,365

\* The years 1907 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1910 and 1916.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 13, section 6, Erie canal; contract No. 92, sections 1, 2 and 3, Erie, and sections 1 and 2, Champlain; contract No. 153, section 6, Erie, and section 1, Oswego; contract No. 158, section 6, Erie.

*Terminal Contract No. 208*

This contract is for constructing terminal warehouses at Fort Plain and Little Falls. It was awarded to the Kennedy and Scullen Construction Company, of Cohoes, being signed on May 7, 1917. Work on the contract was begun at Little Falls on May 23, 1917. The engineer's preliminary estimate for the warehouse at Little Falls, on this section, was \$4,570.00, and the contractor's bid, \$4,639.38.

W. C. Benedict, Assistant Engineer, has been in charge of the work on this contract.

Both warehouses were practically completed during June, except for the electrical work.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Fort Plain</i>			
Excavation.....cu. yds.	40	32	80.0
Second-class concrete.....cu. yds.	50	48	96.0
Iron and steel fastenings.....lbs.	350	362	103.4
Painting.....lump sum	\$185	\$185	100.0
Carpenter work.....lump sum	\$3,637 88	\$3,637 88	100.0
Electric work.....lump sum	\$160	\$80	50.0
Total for Fort Plain.....	\$4,639 38	\$4,527 46	97.6
<i>Warehouse at Little Falls</i>			
Excavation.....cu. yds.	40	30	75.0
Second-class concrete.....cu. yds.	50	43	86.0
Iron and steel fastenings.....lbs.	350	362	103.4
Painting.....lump sum	\$185	\$35 50	30.0
Carpenter work.....lump sum	\$3,637 88	\$3,637 88	100.0
Electric work.....lump sum	\$160	\$40	25.0
Total for Little Falls.....	\$4,639 38	\$4,297 96	92.6
<i>Summary of contract</i>			
Warehouse at Fort Plain.....	\$4,639 38	\$4,527 46	97.6
Warehouse at Little Falls.....	4,639 38	4,297 96	92.6
Gross estimate at contract prices.....	\$9,278 76	\$8,825 42	95.1

*Terminal Contract No. 101*

The portion of the contract affecting this residency provides for furnishing and installing a stiff-leg derrick on the terminal site at Little Falls. The contract was awarded to E. Brown Baker, of Herkimer, N. Y., being signed on December 18, 1916, and on March 26, 1917, it was transferred to the Mohawk Dredge & Dock Company, Inc., of Herkimer, N. Y. The engineer's pre-

liminary estimate on this portion of the work amounted to \$3,420.70, and the contractor's bid was \$5,043.20.

W. C. Benedict, Assistant Engineer, is in charge.

No contract work has been done up to June 30, 1917.

#### *Terminal Contract No. 204*

This contract is for constructing temporary warehouses at Schenectady, Amsterdam, Fonda, Ilion and Frankfort. It was let to Byron, Forman & Riggs, Inc., of Cohoes, being signed on March 12, 1917, and was assigned to Kennedy and Scullen on April 23, 1917, the assignment being approved by the Superintendent of Public Works on May 2, 1917. The engineer's preliminary estimate for the warehouses at Ilion and Frankfort, on this section, was \$1,630.00, and the contractor's bid, \$1,472.80. The contractor's bid for these two warehouses as modified by alteration No. 1 was \$4,955.80.

R. B. Smith is the engineer in charge.

Alteration No. 1, approved by the Canal Board April 12, 1917, provides for increasing the size of the warehouses. It increases the whole contract price by \$14,671.60.

Construction was delayed somewhat by the difficulty in obtaining lumber, but these warehouses have been turned over for use, although the lighting system is not completed.

For details of the quantities estimated see the report of this contract in Residency No. 2, Erie canal.

#### *Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 4 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 3	Contract No. 9	Contract No. 11	Contract No. 27	Contract No. 204 (section 4)	Contract No. 208 (section 4)	
1913.....	\$47,070	\$31,670	\$32,210	\$19,550	.....	.....	\$130,500
1914.....	13,014	33,523	22,519	17,550	.....	.....	86,606
1915.....	.....	.....	.....	4,149	.....	.....	4,149
1917.....	.....	.....	.....	.....	\$4,660	\$4,300	8,960
Totals...	\$60,084	\$65,193	\$54,729	\$41,249	\$4,660	\$4,300	\$230,215

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No work was done on this section during 1916. No extra work orders have been paid on this section.

The other sections on which work has been done under certain of the above terminal contracts are as follows: Contract No. 204, sections 2 and 3, Erie; contract No. 208, section 3, Erie.

*Completing the Improvement of the Channel and Banks of the Mohawk River and West Canada Creek at Herkimer*

(Chapter 245, Laws of 1913, and chapter 728, Laws of 1915)

On October 26, 1915, the Superintendent of Public Works awarded to the State Highway Construction Company, Inc., of Mohawk, N. Y., the contract for completing the improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer, under chapter 245, Laws of 1913, and chapter 728, Laws of 1915. The work consisted mainly in excavating for and placing third-class riprap along the westerly bank of West Canada creek, beginning at a point nearly opposite German street, Herkimer, and extending northerly along the bank. The contractor was allowed to use stone taken from the creek bed, if it was of the required size.

The engineer's estimated cost was \$8,240.00, and the contract was let for \$6,640.00. The work was accepted by the Canal Board May 8, 1917. The final account amounted to \$5,927.00.

The work on this contract has been in charge of C. G. Ranney, Assistant Engineer.

At the end of the year the work which was done under this contract was in good condition and so far, apparently, has served the purpose for which it was done.

There was no plant used on this contract. The stone taken from the creek were either rolled onto stone-boats and hauled by teams to the foot of the bank, or loaded in dump-wagons and hauled to the top of the bank. In either case the stone were hand-laid, the larger stone being laid first and the spaces around filled with stone of smaller size.

The following table shows the status of the contract:

ITEMS OF WORK	Contract quantities as modified by alteration	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	480	258	286	53.7	59.6
Third-class riprap.....cu. yds.	3,200	2,365	2,892	73.9	90.4
Gross estimate at contract prices.....	\$6,640 00	\$4,859 00	\$5,927 00	73.2	89.3

In concluding this report, I desire to mention the following conditions within the limits of this residency:

The Erie canal tow-path between South St. Johnsville and Mindenville has for years been used more or less as a highway. Last winter and the winter before, this was the main and the best route from Mindenville to St. Johnsville. By constructing a culvert in the old Erie canal nearly opposite the westerly end of the upper south approach wall to lock No. 16 and by building a road from the present highway to the old tow-path, there would be provided a good grade and an easy way to reach the power house at lock No. 16 from both St. Johnsville and Little Falls. The cost of this improvement should be less than \$1,000.00.

It is evident from what occurred last winter and the winter before, that something should be done to remedy existing conditions at the entrance of Castle creek into the Barge canal prism. Last winter and spring was the first season since the work on contract No. 18-A had been completed, that is, since the old aqueduct piers and the 400 feet of tow-path located several hundred feet westerly from the aqueduct had been removed. Although the water at the mouth of Castle creek reached elevation 325.3 on March 24, 1917, (crest of Rocky Rift dam = Elev. 319.5) no water went through the opening in the old tow-path. During the month of March, 1917, from the Indian Castle guard-gate to 175 feet westward, the prism was jammed with ice for the full depth and width of the channel.

I believe the only safe and permanent remedy will be to build a spillway in the north bank of the Barge canal prism opposite the present Erie canal aqueduct, this spillway to be closed during navigation, and the crest to be 130 feet long and at elevation 321.5, which is one foot below the retaining dam now in place just north of the present Erie canal aqueduct and two feet above the fixed crest of Rocky Rift dam, so that when navigation is closed, there will be about two feet of water over the fixed crest of Rocky Rift dam before any water will flow over this spillway, unless it is caused by the flow of water in Castle creek. When a flood in Castle creek does occur and ice and driftwood are brought down, it will pass straight through into the river, as it did before the original Erie canal (old Clinton canal) was built. Steel frames with flash-boards similar to the arrangement used on the Rocky

Rift dam could be used to retain the water between elevation 321.5 and extreme high water during navigation, so that these flash-boards would not have to be operated except at the beginning and end of the boating season. A very liberal estimate of the cost of the structure would be from \$17,000 to \$20,000.

During the last two seasons much trouble has been experienced in operating the flash-boards on the Rocky Rift dam. When the water is at elevation from 323 to 325, it is practically impossible to remove the flash-boards or driftwood of any size. A cable across this dam, carrying a small block and fall attached to a pulley on the cable, together with ropes passing through pulleys on the cable, to tie around persons removing the driftwood and flash-boards, the block and fall to be equipped with a hook, etc., to fasten to the flash-boards or to the small driftwood, is an arrangement which would not be expensive and which seems necessary. There should be provided also a small, single-drum, hoisting engine, together with housing, which should be located a short distance above the southerly end of this dam on the river bank and be equipped with a rope, grappling irons, etc., to haul to shore the large logs, trees, etc., that cannot be removed by hand and might bend or break the steel frames of the dam. Several of the frames were broken or bent from this cause during the season of 1916.

A suspension foot-bridge across Castle creek at the location of the old aqueduct, making use of the abutments of the aqueduct for foundations for the supports for the cables, seems necessary. At present, to get to Rocky Rift dam, it is necessary to cross on the guard-gates or use a boat. It is planned to establish a gage at the dam and also the flash-boards need more or less attention throughout the entire boating season.

Some sort of booms, for the purpose of catching and holding driftwood and debris from interfering with navigation and the operation of locks and dams, should be maintained during the boating season at the following localities: In the river channel above the Frankfort retaining dam, at or below the outlet of West Canada creek and above the retaining dam near lock No. 16.

Beginning about 400 feet easterly from the Mindenville bridge and extending westward a distance of nearly two miles, with the exception of 600 feet of retaining wall opposite East Canada

creek, there is a berme which varies in elevation from 1 foot above pool to 5 feet below pool and is from 30 to 40 feet wide. When traffic in the canal increases and boats of 10 or 11 feet draft are used, there will be needed something like ten stake lights set at the south edge of this berme, along this two miles of canal. A similar condition will exist on parts of contracts Nos. 30-A and 29-A, after they are completed.

For the safety of navigation, a buoy should be placed at the lower end of an existing wing wall opposite the Adirondack Woolen Company's plant.

Between old Erie canal lock No. 41, the Fort Herkimer lock, and Barge canal lock No. 18, there are 254 acres of good but isolated land, besides 50 acres of additional tillable land belonging to the State, making a total of more than 300 acres, worth at least \$150 per acre. There is no way to get to this land or to the north embankment above lock No. 18 with a team. I believe a bridge should be built across the prism, located about  $1\frac{1}{2}$  miles westward from lock No. 18. The foundations for the abutments would be on gravel. The total cost of the bridge would be at least \$15,000 to \$18,000.

Within this residency there are hundreds of acres of appropriated land which are either tillable now or could be made so in a short time. Some action should be taken by the Legislature, if such action is necessary, to make it legal for the State to lease this land for terms of five years or more. If this were done, the tenant could afford to fertilize the land and put it in proper condition. The State could advertise this land for rental.

I am very grateful to you and my other superiors in this department for your counsel and consideration and I desire to express the appreciation of the members of the corps in this residency for the good treatment which has been accorded them.

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#### CHAMPLAIN CANAL, RESIDENCY NO. 1

Assistant Engineer R. D. Hayes reports:

This residency extends from the connection with contract No. 1, north of the guard-lock at Northumberland, to the junction with the Erie canal at Waterford. Length, about 27 miles.

Appropriation surveys have been made and maps prepared, the State in some instances reserving flowage rights. Daily gage readings have been taken between locks Nos. 1 and 2, at the B. & M. bridge, in the vicinity of Stillwater dam and at Northumberland. The office work has consisted in checking and typing monthly estimates, making miscellaneous computations and drawings, getting out weekly and monthly reports, pay-rolls, force accounts, etc., for residencies 1, 2 and 3.

During the past year active work has progressed on contracts Nos. 70-A, 72-B, 73-A, 131-A and 140, terminal contract No. 13 and the portion of terminal contract No. 203 in this residency. Contract No. 131, Spaulding Construction Co., contractor, was canceled by order of the Canal Board November 22, 1916. The final account for contract No. 72-A was approved by the Canal Board July 27, 1916. Contract No. 169 has been awarded.

Senior Assistant Engineer E. V. R. Payne was in charge of this residency up to May 8, 1917, since which time it has been under the supervision of the writer.

Following are detailed reports for each contract, together with a summary of quantities and percentages of work done during the year and up to the end of the fiscal year. Previous annual reports give detailed information concerning contracts completed or canceled.

#### *Contract No. 70-A*

This contract is for completing the excavation of a channel in the Hudson river and performing work incidental thereto from Waterford to lock No. 1. It was let to the Central Dredging Company, the contract being signed on October 22, 1912, and was sublet to the Dunbar & Sullivan Dredging Company in February, 1913. The engineer's preliminary estimate was \$790,488.00, and the contractor's bid, \$759,158.88.

John McBride, Assistant Engineer, is in charge.

The prism excavation is done by drill-boats; dipper-dredges and scows. The materials encountered is Hudson river shale, overlaid in most parts by gravel. Spoil-banks are provided on the west bank of the river near the center of the contract on a low river-



flat, where two traveling excavators with drag-line buckets excavated a deep channel connecting with the canal prism. Bottom-dump scows are towed from the dredges into this spoil channel and dumped, then the excavators rehandle the material and place it on a high bank.

Prism excavation between Stas. 1247+80 and 1418+00 with the dipper-dredge continued until December 16, 1916, when operations were suspended for the winter. Operations were resumed early in April, 1917, since which time the channel excavation has been completed and accepted as far south as Sta. 1300+00, thus completing approximately one mile of the 3.2 miles of work.

The river plant consists of two dredges, two drill-boats, three tugboats, four dump-scows, one sweep-scow and two Heyworth excavators.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$1,000	0	\$1,000	0.0	100.0
Excavation..... cu. yds.	522,152	129,486	521,179	24.8	99.8
Sheeting and bracing..... ft. B. M.	2,000	0	0	0.0	0.0
Forming embankment..... cu. yds.	300	0	0	0.0	0.0
Lining..... cu. yds.	210	0	0	0.0	0.0
Second-class concrete..... cu. yds.	140	0	0	0.0	0.0
Wash wall..... cu. yds.	1,000	0	0	0.0	0.0
First-class riprap..... cu. yds.	200	0	0	0.0	0.0
Second-class riprap..... cu. yds.	200	0	0	0.0	0.0
Third-class riprap..... cu. yds.	200	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	200	0	0	0.0	0.0
Iron castings, plain..... lbs.	6,500	0	0	0.0	0.0
Gross estimate at contract prices.....	\$759,158 88	\$186,459 84	\$751,497 76	24.6	99.0
<i>Extra Work Orders</i>					
April 30, 1917..... special unit price	\$1,500 00	.....	\$1,500 00	.....	Finished
July 11, 1917..... special unit price	3,400 00	.....	.....	.....	.....
Total.....	\$4,900 00	.....	\$1,500 00	.....	.....

#### Contract No. 140

This contract was for placing bank protection along the west shore of the Hudson river about five miles north of Waterford and incidental work. It was awarded to Holler & Shepard, being

signed on November 1, 1916. Work was started the first week in November. The engineer's preliminary estimate was \$5,454.50, the contractor's bid, \$4,559.00.

Contract work was completed on December 29, 1916, and the contract was accepted by the Canal Board on January 11, 1917, and the final estimate, amounting to \$4,855.94, was approved on March 14, 1917.

H. L. Clarke, Assistant Engineer, was in charge.

Material was borrowed from a shale pit and placed on the west bank of the Hudson river. The bank thus protected lies within the limits covered by contract No. 71-A. The fill at the north end of the work was started on December 2.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent. final estimate of contract quantities
Clearing.....	.....	.....	.....
Excavation.....	.....	.....	.....
Third-class riprap.....	.....	.....	.....
Gross estimate at contract prices.....	.....	.....	.....

#### *Contract No. 72-A*

This contract is for completing the excavation of a channel in the Hudson river and performing work incidental thereto from lock No. 2 to lock No. 4 and for completing the upper approach wall of lock No. 3. It was awarded to James Stewart & Co., Inc., on March 27, 1913, and work was begun during April, 1913. The engineer's preliminary estimate was \$1,396,585.50, the contractor's bid, \$1,534,603.25.

The contract was accepted July 13, 1916, and the final estimate, amounting to \$1,515,095.31, was approved on July 27, 1916.

W. L. Caler, Assistant Engineer, was in charge.

The work on this contract was practically completed before this year.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$100	\$50	\$100	50.0	100.0
Excavation..... cu. yds.	540,939	6,623	534,220	1.2	98.8
Sheeting and bracing..... ft. B. M.	2,000	0	0	0.0	0.0
Round-timber bracing..... lin. ft.	400	0	0	0.0	0.0
Stone filling in cribs..... cu. yds.	2,400	40	2,379	1.7	96.0
Rock-spoil filling..... cu. yds.	1,000	0	0	0.0	0.0
Structural steel..... lbs.	9,000	227	9,921	2.5	110.2
Iron castings, plain..... lbs.	5,800	0	4,726	0.0	81.5
Sawed lumber..... ft. B. M.	180,000	7,623	187,423	4.2	104.1
Completing the construction of upper approach wall of lock No. 3, lump sum	\$27,000	0	\$27,000	0.0	100.0
Gross estimate at contract prices.....	\$1,534,603 25	\$18,854 25	\$1,515,095 31	1.2	98.7

#### *Contract No. 169*

This contract is for constructing temporary, stone-filled, timber guide-cribs below locks Nos. 3 and 6. It was awarded to Holler & Shepard, being signed on June 28, 1917. The engineer's preliminary estimate was \$3,508.00 and the contractor's bid, \$3,066.00.

No work has been done.

#### *Contract No. 72-B*

This contract is for widening the canal prism in the Hudson river from the mouth of the Hoosic river to the south end of Green island. It was awarded to James Stewart & Co., Inc., being signed on July 7, 1916. The engineer's preliminary estimate was \$207,700.00, the contractor's bid, \$108,540.00. Work began on July 15, 1916.

W. L. Caler, Assistant Engineer, is in charge.

Drilling began on this contract on July 15, 1916, by two drill-boats and a drill-scow, used separately or combined, depending on the work. From June 12 to 21, 1917, a few tripod drills were used in drilling the toe of the prism from Sta. 821 to Sta. 823 + 45.

The dredge started work August 3, 1916. The excavated material was loaded into scows and dumped along Green island, and

later the dredge cast it up on a spoil-bank. On October 7, 1916, the West Virginian Pulp & Paper Company began removing flash-boards from their dam below this contract, thereby lowering the water so that dump cars could be operated in the river bed beside the prism. On October 26, 1916, the dredge began loading material from the prism into these dump cars, which were run upon the island and dumped. This method was followed until December 17, when cold weather stopped the work. On April 28, 1917, the dredge began cleaning up the remaining excavation, which was loading into scows and dumped along Green island and later cast up by dredge.

All prism excavation was practically completed on June 30, 1917.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	67,000	56,236	83.9
Gross estimate at contract prices.....	\$108,540 00	\$91,102 32	83.9

#### *Contract No. 73-A*

This contract is for completing the construction of canal from Northumberland to Stillwater. Length, about 15 miles. It was awarded to the Great Lakes Dredge & Dock Co., being signed on January 15, 1916. The engineer's preliminary estimate was \$432,045.00, and the contractor's bid, \$321,679.92. The contract price as modified by alterations Nos. 1, 2 and 3 is \$458,265.67.

R. D. Hayes, Assistant Engineer, was in charge from July 1, 1916, to May 7, 1917, and Mott Palmer, Junior Assistant Engineer, from May 8 to June 30, 1917.

The alterations on the contract are as follows:

Alteration No. 1, approved by the Canal Board February 23, 1916, provides for changing plans for drain at Standard Wall-Paper Company and for building trestle and bridge across old canal at Schuylerville. It increased the contract price by \$14,924.25.

Alteration No. 2, approved by the Canal Board May 10, 1916, provides for wash wall on dike, for lining on roadway and for preparing contract for opening of navigation on May 15, 1916. It increased the contract price by \$8,887.50.

Alteration No. 3, approved by the Canal Board October 25, 1916, provides for widening the canal between Northumberland dam and the north end of contract, for excavating between old and new canals above lock No. 5 and for excavating for settling basins below lock No. 5. It increased the contract price by \$112,774.00.

Extra work order dated July 13, 1916, provided for underpinning the railway tracks and maintaining highway traffic, in order to construct a core wall which extended under the Hudson Valley tracks and the highway at Northumberland. This work was finished and the final account sent to the Albany office on July 18, 1916. The payment amounted to \$344.15, on a lump sum basis.

Extra work order dated September 5, 1916, provides for placing six timber snubbing-posts back of the timber crib dock above guard-lock No. 10. It is expected that this work order will be canceled.

Extra work order dated December 4, 1916, provided for the relocation of a capstan at the lower end of lock No. 5. The work under this order has been finished, but the final account has not been made up as yet.

*Above Lock No. 5.* Prism excavation has been completed from Sta.-21 to Sta. -11, except for a few high spots. From Sta. -11 to Sta. 5 a 60-foot channel has been excavated. From Sta. 5 to Sta. 18 the prism has been finished and swept. Wash wall has been laid on the west slope from Sta. 5 to Sta. 17. Embankment at Liberty dike has been finished from borrow-pits. The change bridge at Northumberland (about Sta. -20) has been removed. All excavation was done with dipper-dredges.

*At Lock No. 5.* The new bridge at the lower end of lock No. 5 and the roadway on the west side have been finished. A block signal has been erected and a capstan block relocated.

*Below Lock No. 5.* A 60-foot channel has been completed from Sta. 45 to Sta. 63 and part of the settling basin excavated. Rock

from Sta. 68 to Sta. 69, west of the 60-foot channel, has been drilled and blasted, but not excavated.

*At Schuylerville Bridge and Sarles.* Excavation has been completed, except for a few high spots. The prism has not been swept as yet.

*At Stillwater.* A 60-foot channel has been excavated and the remaining rock stripped.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$200	\$20	\$200	10.0	100.0
Excavation..... cu. yds.	391,040	166,232	261,748	42.5	66.9
Sheeting and bracing..... ft. B. M.	*27,000	11,640	36,940	31.5	99.8
Forming embankment..... cu. yds.	26,100	3,427	22,673	13.1	84.9
Lining..... cu. yds.	990	232	1,110	23.4	112.1
Sawn lumber..... ft. B. M.	19,600	10,082	13,267	51.4	67.7
Round-timber bracing..... lin. ft.	15,000	0	2,190	0.0	43.8
Wooden sheet-piling..... ft. B. M.	12,000	0	0	0.0	0.0
Second-class concrete..... cu. yds.	*1,380	53	1,334	3.8	96.7
Wash wall..... cu. yds.	5,980	3,562	5,156	59.6	86.2
Second-class stone paving..... sq. yds.	160	0	29	0.0	18.1
First-class riprap..... cu. yds.	200	0	0	0.0	0.0
Second-class riprap..... cu. yds.	860	0	0	0.0	0.0
Third-class riprap..... cu. yds.	130	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	1,360	0	0	0.0	0.0
Structural steel..... lbs.	92,900	87,420	87,420	94.1	94.1
Iron castings, plain..... lbs.	384,125	2,589	363,474	0.7	94.6
Wooden fence..... lin. ft.	1,920	389	1,273	20.3	66.3
Removing bridge superstructures, lump sum	\$1,000	\$300	\$900	30.0	90.0
Maintaining highway traffic, lump sum	\$200	\$200	\$200	100.0	100.0
Maintaining navigation, lump sum	\$100	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining, lump sum	\$3,000	\$300	\$3,000	10.0	100.0
Block signal, lump sum	\$500	\$500	\$500	100.0	100.0
Building trestle and bridge, lump sum	\$500	\$100	\$500	10.0	100.0
Preparing contract for navigation on May 15, 1916, lump sum	\$5,000	\$1,000	\$5,000	20.0	100.0
Gross estimate at contract prices.....	*\$460,535 67	\$183,673 13	\$318,145 42	39.9	69.1
<i>Extra Work Orders</i>					
July 18, 1916..... lump sum	\$344 15		\$344 15		Finished
Sept. 5, 1916..... cost plus 15 per cent					
Dec. 4, 1916..... cost plus 15 per cent					
Total.....			\$344 15		

\* Figures given include excess quantities authorized by the Canal Board, as follows:

Sheeting and bracing, 15,000 ft. B. M., by resolution dated July 13, 1916.

Second-class concrete, 190 cu. yds., by resolution dated July 13, 1916.

These quantities at the contract prices amount to \$2,270 00.

† Contingent items.

### Contract No. 131

This contract was for completing the reconstruction of the highway bridge crossing the main channel of the Hudson river at

Schuylerville. It was awarded to the Spaulding Construction Company, being signed on March 28, 1916. Work was started in June and suspended in September. The contract was canceled on November 22, 1916. The engineer's preliminary estimate was \$31,248.00 and the contractor's bid, \$29,734.00. The last monthly estimate rendered was for \$858.20.

C. A. Curtis, Assistant Engineer, was in charge.

The old superstructure was partially removed, excavation for the east abutment was finished, piers Nos. 1 and 2 were removed to elevation 82.5 and the curtain walls between the pedestals on existing piers were constructed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	3,000	700	23.3
Lining.....cu. yds.	232	0	0.0
Second-class concrete.....cu. yds.	610	57	9.3
Fourth-class riprap.....cu. yds.	155	0	0.0
Sawed lumber.....ft. B. M.	36,000	0	0.0
Wooden sheet-piling.....ft. B. M.	22,000	0	0.0
Foundation piles.....lin. ft.	1,700	0	0.0
Wooden fence.....lin. ft.	730	0	0.0
Structural steel.....lbs.	360,000	0	0.0
Oil signal-lamps.....No.	6	0	0.0
Removing existing superstructure.....lump sum	\$100	\$75	75.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$1,400	0	0.0
Gross estimate at contract prices.....	\$29,734 00	\$858 20	2.9

#### *Contract No. 131-A*

This contract provides for completing the reconstruction of the highway bridge crossing the main channel of the Hudson river at Schuylerville. It was awarded to Michael Fitzgerald, being signed on March 5, 1917. Work was started in April. The engineer's preliminary estimate was \$30,753.00, and the contractor's bid, \$39,634.00

C. A. Curtis, Assistant Engineer, is in charge.

The false work for the west span has been erected and the rough excavation completed. The sheet-piles for the east abutment have been built and the foundation piles have been delivered. Work has been retarded by high water and by delay in rail shipments.

EASTERN DIVISION: CHAMPLAIN RESIDENCY No. 1 145

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	2,820	508	17.9
Lining.....cu. yds.	232	0	0.0
Second-class concrete.....cu. yds.	550	0	0.0
Fourth-class riprap.....cu. yds.	155	0	0.0
Sawed lumber.....ft. B. M.	39,000	0	0.0
Wooden sheet-piling.....ft. B. M.	22,000	0	0.0
Foundation piles.....lin. ft.	1,700	0	0.0
Wooden fence.....lin. ft.	730	0	0.0
Structural steel.....lbs.	360,000	0	0.0
Oil signal-lamps.....No.	6	0	0.0
Removing existing superstructure.....lump sum	\$25	\$25	100.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$1,200	0	0.0
Gross estimate at contract prices.....	\$39,634 50	\$429 80	1.1

*Construction Work—Barge Canal*

The Barge canal work done on section 1 of the Champlain canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE					
	Contract No. 68	Contract No. 69	Contract No. 70	Contract No. 70-A	Contract No. 71	Contract No. 71-A
1909.....	\$327,440					
1910.....	334,190	\$64,190	\$136,470		\$132,840	
1911.....	258,790	92,110	80,300		513,940	
1912.....	25,748	54,550	19,470		175,180	
1913.....		20,654		\$44,380		\$318,830
1914.....				266,000		751,760
1915.....				165,960		377,540
1916.....				88,690		38,646
1917.....				186,460		
Totals.....	\$946,168	\$231,504	\$236,240	\$751,490	\$821,960	\$1,486,766
<i>Extra Work Orders Paid, 1909-1917, Inclusive</i>						
1911.....					\$85	
1912.....	\$1,645				4,260	
1914.....						\$645
1915.....						290
1916.....						
1917.....				\$1,500		
Totals.....	\$1,645			\$1,500	\$4,345	\$935



YEAR*	VALUE OF WORK DONE					
	Contract No. 72	Contract No. 72-A	Contract No. 72-B	Contract No. 73	Contract No. 73-A	Contract No. 88
1909.....						
1910.....	\$127,380			\$6,000		
1911.....	332,280			410,990		
1912.....	109,280			100,233		\$7,280
1913.....		\$382,950				23,564
1914.....		530,070				
1915.....		475,010				
1916.....		108,210			\$134,470	
1917.....		18,855	\$91,100		183,670	
Totals.....	\$618,900	\$1,515,095	\$91,100	\$517,223	\$318,140	\$30,844

*Extra Work Orders Paid, 1909-1917, Inclusive*

1911.....						
1912.....						
1914.....						
1915.....						
1916.....						
1917.....					\$344	
Totals.....					\$344	

YEAR*	VALUE OF WORK DONE					
	Contract No. 92 (section 1)	Contract No. 126	Contract No. 131	Contract No. 131-A	Contract No. 140	Totals
1909.....						\$327,440
1910.....						801,070
1911.....						1,738,390
1912.....						491,721
1913.....	\$2,890					783,268
1914.....	146,850					1,694,470
1915.....	65,540	\$5,947				1,089,967
1916.....	174					370,190
1917.....			\$850	\$420	\$4,856	486,211
Totals.....	\$215,254	\$5,947	\$850	\$420	\$4,856	\$7,792,757

*Extra Work Orders Paid, 1909-1917, Inclusive*

1911.....						\$8 5
1912.....						5,905
1914.....						645
1915.....	\$5,867	\$154				6,021
1916.....						290
1917.....						1,844
Totals.....	\$5,867	\$154				\$14,790

\* The years 1909 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1909, 1910 and 1913.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 92, sections 1, 2, 3 and 4, Erie canal, and section 2, Champlain.

*Terminal Contract No. 203*

This contract was for constructing temporary terminal warehouses at Troy, Mechanicville, Fort Edward and Port Henry. It was awarded to Collins Bros., of Mechanicville, N. Y., being signed on December 29, 1916. Work was started at Mechanicville in January, 1917, and finished the latter part of February, 1917. The engineer's preliminary estimate for the Mechanicville warehouse was \$815.00, and the contractor's bid, \$746.10.

The whole contract work was accepted by the Canal Board and the final estimate approved June 6, 1917. The amount paid on the Mechanicville warehouse was \$707.02.

H. L. Clarke, Assistant Engineer, was in charge.

For details of quantities estimated see report for this contract in Residency No. 1, Erie canal.

*Terminal Contract No. 13 — Schuylerville*

This contract is for constructing a guard-lock and bridge at Schuylerville. It was awarded to Lou B. Cleveland, being signed on December 29, 1914, and was assigned to the Kendar Engineering and Construction Co., Inc., on December 16, 1915. On February 23, 1916, the Canal Board suspended the contract and since then the work done has been under the supervision of the Department of Public Works, J. W. Holler, of the firm of Holler & Shepard, taking charge. The engineer's preliminary estimate was \$61,664.60, the contractor's bid, \$42,742.80.

C. A. Curtis, Assistant Engineer, is in charge.

The work of concreting and backfilling was completed in October, 1916. The location of the cut-off in the old canal in the vicinity of Fish creek aqueduct was changed from a location 200 feet south of the aqueduct to the concrete structure built on the north foundation wall of the aqueduct. This eliminated all embankment and wooden sheet-piling. The steel for the bridge was placed in the spring of 1917.

Navigation was opened the latter part of September, 1916, and the bridge was thrown open to traffic in April, 1917.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....lump sum	\$50	0	0	0.0	0.0
Excavation.....cu. yds.	12,400	5,108	7,085	41.2	57.0
Sheeting and bracing.....ft. B. M.	11,000	0	29,000	0.0	263.8
Embankment.....cu. yds.	600	0	0	0.0	0.0
Lining.....cu. yds.	50	0	0	0.0	0.0
Sawed lumber.....ft. B. M.	17,500	3,400	8,300	19.4	47.4
White oak lumber in miter-sills.....ft. B. M.	1,000	280	500	28.0	50.0
Foundation piles.....lin. ft.	1,000	0	760	0.0	76.0
Wooden sheet-piling.....ft. B. M.	1,400	0	0	0.0	0.0
First-class reinforced concrete.....cu. yds.	2	0	0	0.0	0.0
Second-class concrete.....cu. yds.	4,700	2,212	4,895	47.1	104.2
Third-class riprap.....cu. yds.	180	0	0	0.0	0.0
Structural steel.....lbs.	56,400	48,316	58,137	85.7	103.1
Metal reinforcement.....lbs.	90	0	0	0.0	0.0
Iron castings, plain.....lbs.	6,900	0	0	0.0	0.0
Iron castings, machined.....lbs.	5,900	0	0	0.0	0.0
Wooden fence.....lin. ft.	250	0	0	0.0	0.0
Maintaining navigation.....lump sum	\$600	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining, lump sum	\$1,000	0	0	0.0	0.0
Gross estimate at contract prices.....	\$42,742 80	\$18,906 39	\$38,194 89	44.2	89.4

### Construction Work — Barge Canal Terminals

The Barge canal terminal work done on section 1 of the Champlain canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE			
	Contract No. 5	Contract No. 13†	Contract No. 203 (section 1)	Totals
1913.....	\$8,860	.....	.....	\$8,860
1914.....	29,760	.....	.....	29,760
1915.....	13,370	.....	.....	13,370
1916.....	221	\$19,280	.....	19,501
1917.....	.....	18,910	\$707	19,617
Totals.....	\$52,211	\$38,190	\$707	\$91,108

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

† All work on this contract has been done by the Superintendent of Public Works.

NOTE.—No extra orders were paid on this section.

Under terminal contract No. 203 work has also been done on section 1, Erie canal, and sections 2 and 3, Champlain.

### CHAMPLAIN CANAL, RESIDENCY No. 2

Assistant Engineer R. D. Hayes reports:

This residency extends from Northumberland bridge across the Hudson river northerly to the highway bridge at Dunham's

Basin, Washington county, and includes the Glens Falls feeder and dam.

The work, which has been of the same character as that on residency No. 1, has been directed from the Mechanicville office.

During the past year active work has progressed on contracts Nos. 1-A, 27-B and 128, and the portion of terminal contract No. 203 in this residency, together with incidental work (relocation of highway east side of Hudson river) connected with contract No. 1-A. Contract No. 169 has been awarded. Following are detailed reports for these contracts. All other contract work on this residency was completed prior to July 1, 1916. Reports on this work are found in previous annual reports.

Up to May 8, 1917, this residency was under the direction of Senior Assistant Engineer E. V. R. Payne, but since that date the writer has been in charge.

#### *Contract No. 128*

This contract provides for constructing the substructure, superstructure and approaches of a highway bridge over the Hudson river at Northumberland. It was awarded to Holler & Shepard, being signed on May 27, 1916. Work was started in August, 1916. The engineer's preliminary estimate was \$77,751.50, the contractor's bid, \$76,486.70.

C. A. Curtis, Assistant Engineer, is in charge.

Since work was started in August it has been carried on continuously, except during the winter. Excavation for the approaches to the bridge was made in the river.

Forms for the river abutment and the two piers were built on the shore, floated to place and sunk, then filled with concrete from a floating mixing plant, the concrete being deposited through a tremie. All concrete work was completed in 1916.

Steel erection started in April, 1917, and all the steel has been placed. One short span is complete, except for painting.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	12,300	10,874	88.4
Lining.....cu. yds.	291	0	0.0
Second-class concrete.....cu. yds.	1,980	1,956	98.8
Fourth-class riprap.....cu. yds.	719	236	32.8
Sawed lumber.....ft. B. M.	73,300	8	0.0
Wooden fences.....lin. ft.	688	0	0.0
Structural steel.....lbs.	719,000	534,819	74.4
Oil signal-lamps.....No.	6	0	0.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$7,500	\$7,500	100.0
Maintaining navigation.....lump sum	\$200	\$200	100.0
Maintaining highway traffic.....lump sum	\$2,000	\$2,000	100.0
Gross estimate at contract prices.....	\$76,486 70	\$59,212 26	77.4

#### *Contract No. 169*

This contract is for constructing temporary, stone-filled, timber guide-cribs below locks Nos. 3 and 6. It was awarded to Holler & Shepard, being signed on June 28, 1917. The engineer's preliminary estimate was \$3,508.00 and the contractor's bid, \$3,066.00.

No work has been done.

#### *Contract No. 1-A*

This contract is for completing the construction of the canal from Crocker's Reef to Fort Edward. It was awarded to Holler & Shepard, being signed on August 31, 1914. The engineer's preliminary estimate was \$90,811.00, the contractor's bid, \$120,459.40. The contract price as modified by alteration No. 1 is \$133,095.40.

James B. Foote, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board December 29, 1915, provides for placing stone protection along the west bank of the Hudson river between the schoolhouse of District No. 5 and the residence of C. B. Hunt, town of Northumberland. It increases the contract price by \$12,636.00.

Extra work order dated March 29, 1917, provides for placing and maintaining flash-boards two feet high on the crest of the dam at Crocker's Reef and for removing them at the close of the navigation season. The contractor is to place and remove these



BARGE CANAL, CONTRACT NO. 128

Bridge crossing the Barge canal and the Hudson river at Northumberland. This structure replaces the bridge which stood at the point where the old canal crossed from the west to the east side of the river and from which boats were towed across.



boards for \$650.00, and to maintain them on a basis of cost plus fifteen per cent.

Under alteration No. 1 about 4,516 cu. yds. of wash wall have been laid on the west side of the Hudson river for bank protection, completing this work. About 1,256 cu. yds. of this amount were laid prior to June 30, 1916.

The dredge excavated rock and earth between Stas. 497 and 320 in the canal prism and material was spoiled east of Belle island. Dredge work was suspended for the winter about November 1, 1916, and resumed about May 19, 1917. The drill-boat operated in the canal prism throughout the season. Drill-boat operations were suspended the latter part of October, 1916, and resumed June 2, 1917.

This contract is nearing completion.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	*105,700	8,486	93,121	8.0	88.1
Forming embankment.....cu. yds.	2,000	0	1,378	0.0	68.8
Finishing concrete surfaces.....sq. yds.	520	115.5	115.5	22.2	22.2
Wash wall.....cu. yds.	5,110	3,256.5	4,839.5	63.7	94.7
Gross estimate at contract prices.....	*\$184,295 40	\$22,581 91	\$162,543 45	12.2	88.2
<i>Extra Work Order</i>					
Mar. 29, 1917, lump sum and cost plus 15 per cent.....					

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Excavation, 32,000 cu. yds., by resolution dated July 27, 1916.  
This quantity at the contract price amounts to \$51,200.00.

### Contract No. 27-B

This contract was for constructing a diversion channel for Bond creek, near lock No. 8. It was awarded to John J. Farrell, Jr., being signed on May 23, 1916. The engineer's preliminary estimate was \$9,725.00, the contractor's bid, \$6,845.00. Work began May 27, 1916.

Work was completed on April 17 and on April 25 it was accepted and the final estimate, amounting to \$6,042.52, approved by the Canal Board.

R. G. Gibson, Assistant Engineer, was in charge.



During the year the excavation of new channel and the cut-off in old channel were completed and riprap was placed.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done to date	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$25	0	\$25	0.0	100.0
Excavation..... cu. yds.	18,000	15,233	16,228	80.5	90.2
Third-class riprap..... cu. yds.	350	250	250	71.4	71.4
Gross estimate at contract prices.....	\$6,845 00	\$5,679 20	\$6,042 50	84.5	86.8

### Construction Work — Barge Canal

The Barge canal work done on section 2 of the Champlain canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE							
	Contract No. 1	Contract No. 1-A	Contract No. 3	Contract No. 7 (section 2)	Contract No. 16 (section 2)	Contract No. 24	Contract No. 26	Contract No. 27
1905.....	\$8,170		\$63,450					
1906.....	39,040		177,910					
1907.....	238,110		225,480	\$9,930				\$36,010
1908.....	149,070		100,950	6,489			\$3,650	217,140
1909.....	30,070		59,520				17,830	125,500
1910.....	7,160		5,990				13,963	
1911.....	421				\$5,380			
1912.....					22,310	\$19,510		
1913.....					10,688	17,640		
1914.....						6,935		
1915.....		\$103,940						
1916.....		36,010						
1917.....		22,590						
Totals.....	\$472,041	\$162,540	\$633,290	\$16,419	\$38,378	\$43,545	\$35,443	\$378,650

### Extra Work Orders Paid, 1905-1917, Inclusive

1909.....			\$42,655					\$12,133
1909.....	\$7,834		12,168					2,752
1910.....			16					
1912.....								
1913.....					\$3,027			
1914.....					40	\$296		
1915.....								
Totals.....	\$7,834		\$54,839		\$3,067	\$296		\$14,885

YEAR*	VALUE OF WORK DONE							Totals
	Contract No. 27-A	Contract No. 27-B	Contract No. 32 (section 2)	Contract No. 54	Contract No. 56	Contract No. 92 (section 2)	Contract No. 128	
1905.....								\$71,620
1906.....								216,950
1907.....								509,530
1908.....								477,299
1909.....								232,920
1910.....			\$29,532	\$12,310				68,945
1911.....	\$73,250			44,540				123,591
1912.....	138,120			137,300				317,240
1913.....	130,770			29,009	\$216,560	\$7,620		412,287
1914.....	116,740				108,210	108,690		339,035
1915.....	33,601				1,513	11,440		150,494
1916.....		\$360				368		36,738
1917.....		5,683					\$59,210	87,483
Totals.....	\$491,481	\$6,043	\$29,532	\$223,159	\$326,283	\$128,118	\$59,210	\$3,044,132

*Extra Work Orders Paid, 1906-1917, Inclusive*

1908.....								\$54,788
1909.....								22,754
1910.....								16
1912.....	\$2,057							2,057
1913.....	27,178			\$734	\$744			31,653
1914.....	26,524				4,218			30,073
1915.....	2,524				2,302	\$247		5,073
Totals.....	\$57,283			\$734	\$7,259	\$247		\$146,444

\* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

Notes.—No extra work orders were paid on this section during 1905, 1906, 1907, 1911, 1916 and 1917.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 7, sections 1, 5, 7 and 9, Erie canal; contract No. 16, section 1, Erie and section 3, Champlain; contract No. 32, section 3, Champlain; contract No. 92, sections 1, 2, 3 and 4, Erie, and section 1, Champlain.

*Terminal Contract No. 203*

This contract was for constructing temporary terminal warehouses at Troy, Mechanicville, Fort Edward and Port Henry. It was awarded to Collins Bros., of Mechanicville, N. Y., being signed on December 29, 1916. Work began at Fort Edward about March 1, 1917, and was finished in April. The engineer's preliminary estimate for the Fort Edward warehouse was \$815.00, and the contractor's bid, \$740.70.

The whole completed contract was accepted by the Canal Board and the final estimate approved June 6, 1917. The amount paid on the Fort Edward warehouse was \$701.25.

H. L. Clarke, Assistant Engineer, was in charge.

For details of quantities estimated see report for this contract in Residency No. 1, Erie canal.

*Construction Work—Barge Canal Terminals*

The Barge canal terminal work done on section 2 of the Champlain canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE				
	Contract No. 7	Contract No. 7-A	Contract No. 34	Contract No. 203 (section 2)	Totals
1913 .....	\$16,830	\$69,280	.....	.....	\$86,110
1914 .....	23,000	45,910	.....	.....	68,910
1915 .....	4,815	14,420	\$11,680	.....	30,915
1916 .....	.....	10,102	3,946	.....	14,048
1917 .....	.....	.....	.....	\$701	701
Totals.....	\$44,645	\$139,712	\$15,626	\$701	\$200,684

<i>Extra Work Orders Paid, 1913-1917, Inclusive</i>					
1915 .....	\$1,097	.....	.....	.....	\$1,097
1916 .....	.....	\$543	\$502	.....	1,045
Totals.....	\$1,097	\$543	\$502	.....	\$2,142

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on the contracts on this section during 1913, 1914 and 1917.

Under terminal contract No. 203 work has also been done on section 1, Erie canal, and sections 1 and 3, Champlain.

*Highway Adjacent to Contract No. 1-A*

Under an agreement between the Superintendent of Public Works and Holler & Shepard, dated September 8, 1916, there was a change made in the location of the highway north of the Moses kill, on the east side of the Hudson river. The highway was moved back a short distance from the river on account of the bank caving in, and use was made of a part of the tow-path of the old Champlain canal for a portion of this roadway.

The following shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	1,970	1,552	78.8
Lining.....cu. yds.	670	627	93.6
Wooden fence.....lin. ft.	2,590	2,413	93.2
Gross estimate at contract prices.....	\$3,090 60	\$2,797 36	90.5

## CHAMPLAIN CANAL, RESIDENCY No. 3

Assistant Engineer R. D. Hayes reports:

Residency No. 3, Champlain canal, extends from the highway bridge at Dunham's Basin, Washington county, northerly to Lake Champlain at Whitehall, a distance of 19.8 miles. The terminal work on Lake Champlain is also reported with this residency.

Data have been compiled for claims of property owners against the State and forwarded to the Albany office. Gages have been placed at both ends of each lock.

During the past year active work has progressed on terminal contract No. 26 and the portions of terminal contracts Nos. 201 and 203 in this residency. Also terminal contract No. 101 has been awarded.

*Construction Work — Barge Canal*

The Barge canal work done on section 3 of the Champlain canal is summarized by years and contracts in the following table:

YEAR ENDED SEPT. 30	VALUE OF WORK DONE							Totals
	Contract No. 15	Contract No. 16 (section 3)	Contract No. 25	Contract No. 25 (special)	Contract No. 32 (section 3)	Contract No. 33 (section 3)	Contract No. 90 (section 3)	
1907.....	\$101,290	.....	\$47,760	.....	.....	.....	.....	\$149,050
1908.....	589,050	.....	359,610	.....	.....	.....	.....	948,660
1909.....	238,580	.....	482,670	.....	.....	.....	.....	721,250
1910.....	162,120	.....	313,920	.....	\$14,843	.....	.....	491,683
1911.....	226,020	.....	208,130	.....	.....	\$660	47,990	480,800
1912.....	61,896	\$43,630	115,270	.....	.....	1,795	39,150	261,741
1913.....	.....	3,817	16,711	.....	.....	.....	934	21,463
1914.....	.....	.....	.....	\$6,029	.....	.....	.....	6,029
Totals.....	\$1,378,956	\$47,447	\$1,542,271	\$6,029	\$14,843	\$2,455	\$38,874	\$3,080,875

<i>Extra Work Orders Paid, 1907-1914, Inclusive</i>								
1908.....	\$4,950	.....	.....	.....	.....	.....	.....	\$4,950
1909.....	550	.....	\$550	.....	.....	.....	.....	1,100
1911.....	141	.....	775	.....	.....	.....	.....	916
1912.....	3,574	.....	1,785	.....	.....	.....	\$1,203	6,562
1913.....	.....	.....	1,812	.....	.....	.....	1,315	3,127
Totals.....	\$9,215	.....	\$1,922	.....	.....	.....	\$2,518	\$16,655

NOTE.—The Barge canal work on this section was finished in 1914.

No extra work orders were paid on this section during 1907, 1910 and 1914.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 16, section 1, Erie canal, and section 2, Champlain; contract No. 32, section 2, Champlain; contract No. 33, section 1, Erie, and section 1, Oswego; contract No. 90, section 6, Erie, and section 1, Oswego.

*Terminal Contract No. 201*

This contract provides for constructing terminal warehouses at Albany and Whitehall. It was awarded to J. A. Laporte, being signed on January 2, 1917. Work began on June 20, 1917. The engineer's preliminary estimate for the Whitehall warehouse was \$22,800.00, and the contractor's bid, \$25,068.35.

R. G. Gibson, Assistant Engineer, is in charge at Whitehall.

The excavation for the outshore and south end walls at Whitehall has been finished and the depressed roadway is about one-half completed.

For details of quantities estimated see report of this contract in Residency No. 1, Erie canal.

*Terminal Contract No. 101*

This contract provides for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, being signed on December 18, 1916, and was assigned to the Mohawk Dredge and Dock Co., Inc., on March 26, 1917. The engineer's preliminary estimate for the derrick at Whitehall was \$3,745.70, and the contractor's bid, \$5,500.20.

No construction work has been done.

*Terminal Contract No. 203*

This contract was for constructing temporary terminal warehouses at Troy, Mechanicville, Fort Edward and Port Henry. It was let to Collins Bros., of Mechanicville, N. Y., the contract being signed on December 29, 1916. Work started at Port Henry about April 1, 1917, and was finished in the latter part of same month. The engineer's preliminary estimate for the Port Henry warehouse was \$815.00, and the contractor's bid, \$746.10.

The whole completed contract was accepted by the Canal Board and the final account, amounting to \$3,093.78, was approved June 6, 1917.

The amount paid on this part of the contract was \$707.52.

H. L. Clarke, Assistant Engineer, was in charge.

For details of quantities estimated see report of this contract in Residency No. 1, Erie canal.

*Terminal Contract No. 26 — Rouses Point*

This contract is for constructing a terminal at Rouses Point. It was awarded to John E. Byron & Co., being signed on October 30, 1916. The engineer's preliminary estimate was \$51,200.00, and the contractor's bid, \$55,678.50.

H. L. Clarke, Assistant Engineer, is in charge.

Early in January, 1917, the contractor started to get out timber at Wright's, on the line of the D. & H. R. R. Active operations were started on May 16, 1917, with a one-yard clam-shell bucket, material being removed along the west end of the crib. Three cribs have been completed and sunk into place. A stiff-leg derrick has been set up on the Rutland dock. Some delay has been caused by shortage of round timber.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing.....	lump sum \$25	0	0.0
Excavation.....	cu. yds. 40,000	2,255	5.6
Forming embankment.....	cu. yds. 24,400	438	18.0
Round timber in cribs.....	lin. ft. 70,000	10,512	15.0
Slab sheeting.....	sq. ft. 21,500	3,343	15.5
Stone filling in cribs.....	cu. yds. 3,800	20	0.5
Fender piles.....	lin. ft. 1,720	0	0.0
Second-class concrete.....	cu. yds. 920	0	0.0
Structural steel.....	lbs. 780	0	0.0
Ties for crib anchorage.....	No. 22	0	0.0
Iron castings, plain.....	lbs. 4,100	0	0.0
Malleable cast-iron nosing.....	lin. ft. 460	0	0.0
Second-class riprap.....	cu. yds. 880	0	0.0
Broken stone or gravel surfacing.....	cu. yds. 785	0	0.0
Gross estimate at contract prices.....	\$55,678 50	\$4,013 05	7.2

*Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 3 of the Champlain canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 6	Contract No. 23	Contract No. 25	Contract No. 26	Contract No. 201 (section 3)	Contract No. 203 (section 3)	
1913.....	\$35,200	\$23,940	.....	.....	.....	.....	\$59,140
1914.....	11,796	89,430	\$22,050	.....	.....	.....	123,276
1915.....	.....	12,387	30,660	.....	.....	.....	43,047
1916.....	.....	.....	36,844	.....	.....	.....	36,844
1917.....	.....	.....	.....	\$4,010	\$400	\$708	5,118
Totals...	\$46,996	\$125,757	\$89,554	\$4,010	\$400	\$708	\$267,425
<i>Extra Work Orders Paid, 1913-1917, Inclusive</i>							
1914.....	.....	\$2,033	.....	.....	.....	.....	\$2,033
1915.....	.....	1,722	.....	.....	.....	.....	1,722
1916.....	.....	.....	\$85	.....	.....	.....	85
Totals...	.....	\$3,755	\$85	.....	.....	.....	\$3,840

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.— No extra work orders were paid on the contracts on this section during 1913 and 1917. The other sections on which work has been done under certain of the above terminal contracts were as follows: Contract No. 201, section 1, Erie canal; contract No. 203, section 1, Erie, and section 1 and 2, Champlain.

## NEW YORK RESIDENCY

Senior Assistant Engineer Edward Anderberg reports:

The New York residency takes in all work of the Department in Greater New York and vicinity, both Barge canal terminals and other miscellaneous work that is assigned.

The work in connection with Barge canal terminals during the past year included the preparation of plans and specifications for several contracts and the supervision of four construction contracts. The miscellaneous work handled during the year included the supervision of the construction of a concrete pier built by the Fire Island State Park Commission (chapter 727, Laws of 1915) at Babylon, L. I., the surveys and maps made in connection with six applications for grants of land under water, valuation survey of structures and improvements at the State

Quarantine Station at Rosebank, S. I., Hoffman and Swinburne islands (chapter 342, Laws of 1916) and a survey and compilation of data in connection with the appropriation of a site for a United States fort at Rockaway Point (chapter 130, Laws of 1917).

The preliminary work for various Barge canal terminals progressed as follows:

*Piers 5 and 6, East River, Manhattan*

Contract plans and estimate for a freight shed on pier 6, terminal contract No. 207, were under way and are 85 per cent completed.

*Grand Street, East River, Manhattan*

A field party located buildings and structures on the site.

*West 53d Street, North River, Manhattan*

Test piles were driven over the site for the proposed pier. Contract plans, preliminary estimate and specifications were 85 per cent completed for terminal contract No. 38, which provides for constructing a pier 700 x 90 feet.

*East 138th Street, Harlem River, Bronx*

A field party completed wash borings and test pits. Contract drawings, preliminary estimate and specifications were completed for terminal contract No. 44, which provides for constructing a canal basin, a new bulkhead and approaches.

*Gowanus Bay, Brooklyn*

Plans, preliminary estimate and specifications were completed for terminal contract No. 55, which provides for the construction of a pier approximately 1,225 x 150 feet.

*Greenpoint, Brooklyn*

Contract plans for a freight shed are under way.

*Hallets Cove, Queens*

A field party completed taking wash borings.



*Flushing Bay, Queens*

A field party took soundings off shore in Flushing river. Studies and estimates were made for several proposed developments of this site.

*Kingston, Hudson River*

A field survey was made of a proposed site for this terminal.

The construction work on this residency has been as follows:

*Terminal Contract No. 18 — Gowanus Bay*

This contract provided for dredging the terminal basin, filling the area behind the bulkheads, constructing bulkheads and extending a sewer for the Gowanus bay terminal, between Columbia and Henry streets, borough of Brooklyn. It was let to Geo. W. Rogers & Co., Inc., of New York city, the contract being signed on July 15, 1914. Work was begun on July 30, 1914. The engineer's preliminary estimate was \$365,707.00, and the contractor's bid, \$313,130.25. The contract price as modified by alteration No. 1 is \$326,880.35.

This contract was completed during the year and was accepted by resolution of the Canal Board on June 27, 1917. The final account, amounting to \$304,661.48, was approved September 5, 1917.

L. T. Howard, Assistant Engineer, was in charge.

Alteration No. 1, approved by the Canal Board October 26, 1915, provided for repairing and reinforcing the bulkheads along Henry and Columbia streets. It increased the contract price by \$13,750.10.

Extra work order dated July 15, 1915, provided for furnishing labor and materials to prevent leakage of hydraulic filling through the riprap at the bulkhead wall.

Extra work order dated October 6, 1915, provided for removing the damaged portion of the bulkhead along Henry street, for furnishing and driving foundation piles in the bulkhead and anchorages and for furnishing and placing the bottom wale.

Extra work order dated August 15, 1916, provided for placing a valve on the new Columbia street water-main to connect the water-supply system for this terminal.

During the year the hydraulic dredge removed 54,721 cu. yds. of excavation and filling, and two clam-shell dredges removed 264,227 cu. yds. of excavation, which were dumped at sea.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	762,560	258,637	786,271	33.9	103.1
Excavation and filling.....cu. yds.	499,000	59,187	390,816	11.9	76.3
Excavation of rock-filled crib.....cu. yds.	7,200	1,237	8,099	17.2	112.5
Sawed lumber.....ft. B. M.	294,000	18,760	279,611	6.4	95.1
Foundation piles.....lin. ft.	95,800	353	93,286	0.4	97.4
Fender piles.....No.	85	0	84	0.0	98.8
Wooden sheet-piling.....ft. B. M.	276,000	813	216,686	0.3	78.5
Second-class concrete.....cu. yds.	1,275	1.1	1,158.1	0.1	90.8
Reinforced concrete.....cu. yds.	70	2.7	56.7	3.9	81.0
Riprap.....cu. yds.	33,000	863	25,216	2.6	76.4
Reinforced concrete pipe.....lin. ft.	2,120	0	2,014	0.0	95.0
Wrought-iron and steel.....lbs.	29,600	1,217	31,125	4.1	105.2
Metal reinforcement.....lbs.	4,600	0	4,135	0.0	89.9
Iron castings, plain.....lbs.	5,200	2	4,859	0.0	93.4
Pile shoes.....No.	1,500	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$2,000	0	\$2,000	0.0	100.0
Removal of old wrecks, timber, piles, etc.....lump sum	\$14,000	\$280	\$14,000	2.0	100.0
Removal of old pier.....lump sum	\$1,200	0	\$1,200	0.0	100.0
Gross estimate at contract prices.....	\$326,880 35	\$58,186 80	\$304,661 48	17.8	93.2
<i>Extra Work Orders</i>					
July 15, 1915.....cost plus 15 per cent			\$6,117 65		Finished
Oct. 6, 1915.....cost plus 15 per cent			12,383 24		Finished
Aug 15, 1916.....lump sum	\$42 03		42 03		Finished
Total.....			\$18,542 92		Finished

### *Terminal Contract No. 52 — Pier 6, East River*

This contract provides for widening and repairing existing Pier 6, East river, which is part of the canal terminal at Coenties slip, borough of Manhattan. It was awarded to Kaufman & Garcey, being signed on July 27, 1916. Work began on October 13, 1916. The engineer's preliminary estimate was \$89,974.00, the contractor's bid, \$91,317.75. The contract price as modified by alterations Nos. 1, 2 and 3 is \$109,357.75.

Ely Gamse, Assistant Engineer, is in charge.

The alterations on this contract are as follows:

Alteration No. 1, approved by the Canal Board January 4, 1917, provides for furnishing and placing riprap stone about certain piles of the foundation for this pier. It increased the contract price by \$500.00.

Alteration No. 2, approved by the Canal Board April 4, 1917, provides for additional piles, for removing and replacing additional portions of the pier deck and for changing the location of the scale pit. It increased the contract price by \$18,280.00.

Alteration No. 3, approved by the Canal Board June 27, 1917, substitutes one-way spools for special roller cleats, and structural steel for cast steel capstan recess covers. It decreased the contract price by \$740.00.

Extra work order dated January 17, 1917, provided for the rental of street space north and south of Pier 6, E. R., from November 8, 1916, to February 1, 1917.

Extra work order dated March 8, 1917, provided for the rental of street space north and south of Pier 6, E. R., from February 1, 1917, to May 1, 1917.

Extra work order dated March 27, 1917, provides for removing certain rangers in the floor system of the old pier, which was not provided for in the original contract. Work required by this order is now in progress.

Most of the existing concrete deck, the entire old fender system and the outside timber work were removed. Also most of the old piles in the interior were cut off, for the purpose of making the required repairs.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Total work done to date	Per cent of work done to date
Removing concrete deck.....sq. ft.	28,800	21,361	74.2
Foundation and bracing piles.....lin. ft.	42,500	39,665	93.3
Fender piles.....No.	133	130	97.7
Sawed lumber.....ft. B. M.	223,000	110,238	49.4
Sawed lumber, treated.....ft. B. M.	424,000	302,305	71.3
Surface treatment of existing timber.....sq. ft.	15,500	0	0.0
Second-class concrete.....cu. yds.	49	0	0.0
First-class reinforced concrete.....cu. yds.	1,243	0	0.0
Rigid metal conduit.....lbs.	2,650	0	0.0
Structural steel.....lbs.	246,600	47,156	19.1
Iron castings, plain.....lbs.	10,700	0	0.0
One-way spools.....No.	9	0	0.0
Metal reinforcement.....lbs.	95,500	0	0.0
Pile shoes.....No.	100	0	0.0
Asphalt pavement.....sq. yds.	5,670	0	0.0
Riprap (alteration No. 1).....cu. yds.	500	458	91.6
Removal of old material (alteration No. 2).....hump sum	\$2,750	\$2,502 50	91.0
Gross estimate at contract prices.....	\$109,357 75	\$53,668 25	49.1
<i>Extra Work Orders</i>			
Jan. 17, 1917.....actual cost		\$161 17	Finished
Mar. 8, 1917.....actual cost		173 50	Finished
May 27, 1917.....cost plus 15 per cent			
Total.....		\$334 67	

*Terminal Contract No. 19 — Greenpoint*

This contract provides for dredging the canal basin, constructing a new reinforced concrete bulkhead wall and pier, and repairing two existing timber piers and a timber bulkhead at the Greenpoint terminal, borough of Brooklyn. It was awarded to McHarg-Barton Co., being signed on November 24, 1916. Work was commenced on February 20, 1917. The engineer's preliminary estimate was \$193,500.00 and the contractor's bid, \$207,383.00.

S. R. Bellows, Assistant Engineer, is in charge.

The contractor's plant consists of a dipper-dredge, floating pile-driver, derrick-scow, floating compressor plant and shop for bending reinforcing bars.

The dipper-dredge *America* excavated 50,337 cu. yds. of material, which included sand, mud and old crib.

The upland portion was partly cleared of old pavements, roadway planks and railroad tracks.

Considerable old material was removed from the Dupont street timber pier for the purpose of making repairs, and the repairs to this pier have progressed. Some new piles were driven, caps were repaired and new braces and rangers were put in place.

The south crib bulkhead was removed to low water and was partly rebuilt.

For the new reinforced concrete bulkhead wall, piles were driven from rows 1 to 17, inclusive, and form boxes for the precast reinforced concrete foundation blocks were made.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing.....	lump sum \$300	\$100	50.0
Removing old material.....	lump sum \$4,000	\$2,360	59.0
Excavation.....	cu. yds. 77,600	50,337	64.9
Forming embankment.....	cu. yds. 6,400	0	0.0
Stone filling.....	cu. yds. 750	0	0.0
Round timber.....	lin. ft. 2,350	1,276	54.2
Foundation and bracing piles.....	lin. ft. 88,400	8,535	10.0
Fender piles.....	No. 300	0	0.0
Sawn lumber.....	ft. B. M. 550,000	28,200	5.1
Half-round oak fenders.....	lin. ft. 648	0	0.0
Second-class concrete.....	cu. yds. 200	0	0.0
Third-class concrete.....	cu. yds. 400	0	0.0
First-class reinforced concrete.....	cu. yds. 2,300	0	0.0
Rigid metal conduit.....	lbs. 2,850	0	0.0
Steel castings.....	lbs. 21,200	0	0.0
Iron castings, plain.....	lbs. 34,000	0	0.0
Metal reinforcement.....	lbs. 463,220	0	0.0
Structural steel.....	lbs. 212,100	1,604	0.8
Spools.....	No. 13	0	0.0
Pile shoes.....	No. 280	0	0.0
Riprap.....	cu. yds. 6,000	0	0.0
Stone-block pavement.....	sq. yds. 1,400	0	0.0
Concrete edging.....	lin. ft. 600	0	0.0
Relaying stone-block pavement.....	sq. yds. 1,000	0	0.0
Asphalt pavement.....	sq. yds. 1,200	0	0.0
Gross estimate at contract prices.....	\$207,383 00	\$25,289 07	12.2

### *Terminal Contract No. 44—Mott Haven*

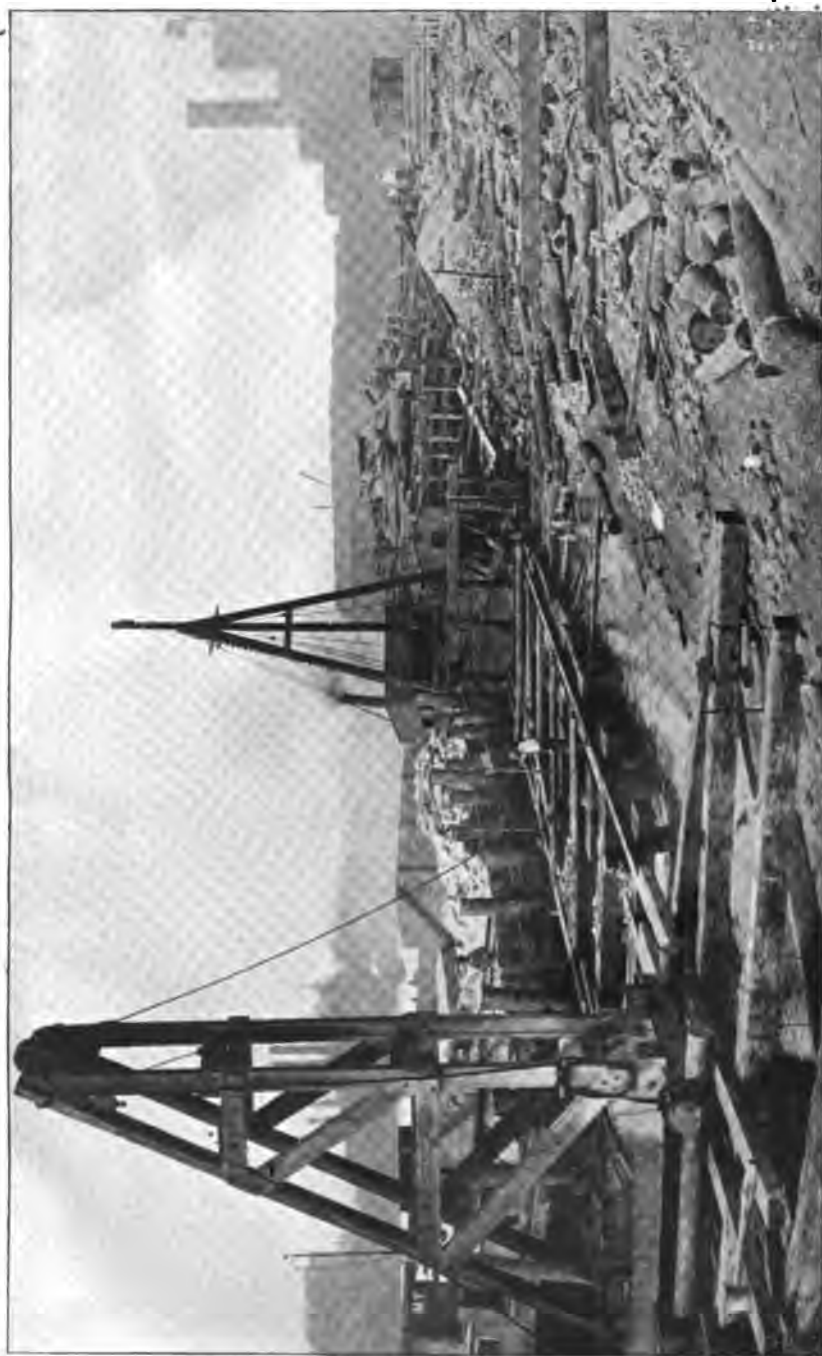
This contract provides for excavating a terminal basin, constructing a dockwall, grading the upland and building approaches for a Barge canal terminal at Mott Haven, near East 138th street, borough of Bronx. It was awarded to Geo. W. Rogers, & Co., Inc., being signed on June 8, 1917. Work was begun the next day. The engineer's preliminary estimate was \$170,300.00, and the contractor's bid, \$193,651.00.

W. C. Bratton, Assistant Engineer, is in charge.

Work was started on June 9 by a clam-shell dredge, which removed 13,191 cu. yds. of old crib and rock backfill up to the end of the fiscal year. The removal of old sheds and the timber mooring platform at the south end progressed.

The new construction that was done involved driving piles and framing timber for the 24-foot extension on the west side of the pier and for the 11-foot extension on the east side; placing caps, posts, clamps and rangers in the interior of the pier; placing the new fender system; building some of the precast foundation blocks and placing riprap around some of the foundation piles.

The contractors' plant consisted of a floating pile-driver, a land



BARGE CANAL TERMINAL (CONTRACT NO. 44 — NEW YORK

Construction of the 600-foot bulkhead wall at Mott Haven. View showing a section with piles driven, platform begun and riprap being placed.

200

pile-driver, locomotive crane, power saw, compressor plant and plant for treating lumber with wood preservative.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Removal of old material..... lump sum	\$1,600	\$1,120	70.0
Excavation..... cu. yds.	68,000	13,191	19.4
Sheeting and bracing..... ft. B. M.	45,000	0	0.0
Forming embankment..... cu. yds.	8,100	0	0.0
Round timber..... lin. ft.	2,700	0	0.0
Stone filling..... cu. yds.	430	0	0.0
Foundation piles..... lin. ft.	46,275	81	0.2
Fender piles..... No.	116	0	0.0
Sawed lumber..... ft. B. M.	179,000	0	0.0
Wooden sheet-piling..... ft. B. M.	85,000	0	0.0
Half-round oak fenders..... lin. ft.	200	0	0.0
First-class concrete..... cu. yds.	790	0	0.0
Second-class concrete..... cu. yds.	900	0	0.0
Iron and steel fastenings..... lbs.	14,075	0	0.0
Steel castings..... lbs.	4,865	0	0.0
Iron castings, plain..... lbs.	4,500	0	0.0
Steel sheet-piling..... sq. ft.	1,300	0	0.0
Wrought-iron pipe railing..... lin. ft.	1,228	0	0.0
Pile shoes..... No.	1,530	0	0.0
Riprap..... cu. yds.	7,450	0	0.0
Gravel surfacing..... cu. yds.	110	0	0.0
Steel picket fence..... lin. ft.	530	0	0.0
Stairway..... lump sum	\$300	0	0.0
Gross estimate at contract prices.....	\$193,651 00	\$20,683 18	10.7

### Construction Work—Barge Canal Terminals

The Barge canal terminal work done, New York city, is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE				
	Contract No. 18	Contract No. 19	Contract No. 44	Contract No. 52	Totals
1914.....	\$19,320	.....	.....	.....	\$19,320
1915.....	212,530	.....	.....	.....	212,530
1916.....	14,620	.....	.....	.....	14,620
1917.....	58,191	\$25,280	\$20,680	\$53,660	157,811
Totals.....	\$304,661	\$25,280	\$20,680	\$53,660	\$404,281
<i>Extra Work Orders Paid, 1914-1917, Inclusive</i>					
1915.....	\$6,118	.....	.....	.....	\$6,118
1916.....	12,383	.....	.....	.....	12,383
1917.....	42	.....	.....	\$335	377
Totals.....	\$18,543	.....	.....	\$335	\$18,878

\* The years 1914 and 1915 are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid during 1914.



THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE EASTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED JUNE 30, 1917.

*Ordinary Repairs to Canals—Erie Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Geo. D. Williams.....	Division engineer.....	\$4,800 per year	\$3,200 00	\$90 71	\$3,290 71
R. S. Greenman.....	Senior assistant engineer.....	3,060 per year	2,010 00		2,010 00
Hattie A. Dell.....	Stenographer.....	1,200 per year	800 00		800 00
			\$6,010 00	\$90 71	\$6,100 71
<i>Incidental Expenses</i>					
Stationery and printing.....				\$181 80	
Miscellaneous.....				157 97	
					339 77
Total.....					\$6,440 48

*Ordinary Repairs to Canals—Champlain Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Geo. D. Williams.....	Division engineer.....	\$4,800 per year	\$1,600 00	\$61 86	\$1,661 86
R. S. Greenman.....	Senior assistant engineer.....	3,060 per year	1,005 00		1,005 00
Hattie A. Dell.....	Stenographer.....	1,200 per year	400 00		400 00
Henry MacFarlane.....	Laborer.....	2 50 per day	40 00		40 00
Jas. R. VanSchoonhoven.....	Laborer.....	2 50 per day	45 00		45 00
			\$3,090 00	\$61 86	\$3,151 86
<i>Incidental Expenses</i>					
Stationery and printing.....				\$22 00	
Postage.....				128 40	
Miscellaneous.....				257 26	
					407 66
Total.....					\$3,559 52

*Construction of Barge Canal—Head Office Account*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
D. B. La Du.....	Special deputy state engineer.....	\$7,000 per year	\$3,083 33	\$751 15	\$3,834 48
D. H. Daley.....	Senior assistant engineer.....	2,820 per year	2,371 00	18 29	2,389 29
R. S. Greenman.....	Senior assistant engineer.....	3,060 per year		1,040 41	1,040 41
C. H. MacCulloch.....	Senior assistant engineer.....	3,540 per year	3,135 00	8 01	3,143 01

*Construction of Barge Canal—Head Office Account—(Cont'd)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
J. M. C. Quarles de Quarles	Senior assistant engineer	\$2,820 per year	\$2,505 00		\$2,505 00
G. G. Underhill	Senior assistant engineer	3,080 per year	2,776 19	\$258 40	3,034 59
N. E. Whitford	Senior assistant engineer	3,030 per year	3,015 00	196 11	3,211 11
C. H. Wood	Senior assistant engineer	2,820 per year	2,434 50	65 83	2,500 33
Henry C. Allen	Consulting engineer	60 00 per day	1,800 00	209 46	2,009 46
Henry Goldmark	Consulting engineer	60 00 per day	900 00	149 37	1,049 37
E. E. Haakell	Consulting engineer	60 00 per day	1,800 00	310 82	2,110 82
E. C. Moore	Consulting engineer	60 00 per day	1,880 00	207 05	2,087 05
Jos. Ripley	Consulting engineer	7,200 per year	7,061 94	159 12	7,221 06
R. E. Phillips	Engineer of claims	4,200 per year	4,200 00	580 86	4,780 86
C. C. Egbert	Expert in electrical design	20 00 per day	310 00	114 89	424 89
R. G. Finch	Chief clerk	4,200 per year		60 00	60 00
G. W. Codwise	Confidential assistant	4,000 per year	3,634 42	71 81	3,706 23
Leland D. McCormac	Private secretary	2,400 per year		59 63	59 63
J. F. McManus	Messenger	900 per year	825 00		825 00
J. J. Allen	Canal clerk	1,800 per year	1,800 00		1,800 00
C. B. Dunham, Jr.	Clerk	2,100 per year	2,100 00		2,100 00
J. T. Gorman	Clerk	1,680 per year	1,680 00		1,680 00
J. C. Guffin	Clerk	1,500 per year	1,500 00		1,500 00
J. E. F. Minnock	Clerk	1,680 per year	1,680 00		1,680 00
G. T. Waterman	Clerk	1,200 per year	1,200 00		1,200 00
Edna A. Albert	Junior clerk	600 per year	275 80		275 80
Mary A. Broughton	Stenographer	600 per year	30 00		30 00
Nellie Clark	Stenographer	1,200 per year	1,200 00		1,200 00
W. L. Collins	Stenographer	1,200 per year	1,100 00		1,100 00
Agnes Fogarty	Stenographer	1,200 per year	1,116 66		1,116 66
Mary G. Harrington	Stenographer	1,200 per year	1,200 00		1,200 00
Ella Harrington	Stenographer (temporary)	900 per year	75 00		75 00
Grace Haswell	Stenographer	1,350 per year	512 50		512 50
Bertha E. Kirchner	Stenographer	1,200 per year	700 00		700 00
Edna B. Shields	Stenographer	480 per year	139 35		139 35
J. J. Tobin	Stenographer	1,680 per year	1,680 00		1,680 00
Cleora Van Vleck	Stenographer	1,200 per year	700 00		700 00
Anna M. Weber	Stenographer	1,350 per year	512 50		512 50
Jennie J. Weller	Stenographer (temporary)	1,200 per year	100 00		100 00
Henry Auerbach	Assistant engineer	2,208 per year	1,806 17		1,806 17
T. S. Bailey	Assistant engineer	2,340 per year	175 50		175 50
H. W. Benedict	Assistant engineer	7 00 per day	1,526 00	48 64	1,574 64
F. E. Blake	Assistant engineer	2,580 per year	1,787 98		1,787 98
H. E. Brainard	Assistant engineer	2,580 per year	820 00		820 00
E. A. Brainard	Assistant engineer	2,580 per year	2,205 00		2,205 00
Clark Brown	Assistant engineer	2,208 per year	2,197 00		2,197 00
N. E. Cottrell	Assistant engineer	1,980 per year	1,809 00		1,809 00
J. B. Doyle	Assistant engineer	2,208 per year	1,936 90	38 33	1,975 23
G. E. Gibson	Assistant engineer	2,340 per year	1,946 91	309 74	2,256 65
M. W. Grimes	Assistant engineer	1,980 per year	1,905 00	81 17	1,986 17
F. B. Hall	Assistant engineer	2,340 per year	2,111 21		2,111 21
A. G. Hayden	Assistant engineer	2,580 per year	2,160 04		2,160 08
T. R. Hazelum	Assistant engineer	1,980 per year	1,740 00		1,740 00
R. L. Holt	Assistant engineer	2,208 per year	198 00		198 00
Geo. D. Kellogg	Assistant engineer	2,208 per year	1,319 56		1,319 56
O. F. Lewis	Assistant engineer	2,208 per year	678 00	3 86	681 86
J. B. Maguire	Assistant engineer	2,208 per year	2,079 52	140 62	2,220 14
W. S. McDowell	Assistant engineer	2,208 per year	1,952 00		1,952 00
R. H. Merrill	Assistant engineer	2,208 per year	2,197 00	321 33	2,518 33
C. W. Morris, Jr.	Assistant engineer	1,980 per year	1,905 00		1,905 00
J. T. Murphy	Assistant engineer	2,208 per year	2,232 00		2,232 00
J. P. Newton	Assistant engineer	2,340 per year	2,230 00	188 58	2,418 58
E. P. Neuschwander	Assistant engineer	2,580 per year	2,311 00	22 48	2,333 48
J. A. O'Donnell	Assistant engineer	1,980 per year	1,813 21		1,813 21
D. W. Overocker	Assistant engineer	2,208 per year	1,945 20		1,945 20
J. M. Prior	Assistant engineer	1,980 per year	1,730 00		1,730 00
C. E. Quimby	Assistant engineer	1,980 per year	1,605 00		1,605 00
E. G. Raynor	Assistant engineer	2,208 per year	2,197 00		2,197 00
L. S. Rickard	Assistant engineer	1,980 per year	1,837 00	16 45	1,903 45
E. G. Semon	Assistant engineer	2,208 per year	1,749 26	46 65	1,795 91
W. H. Slingerland	Assistant engineer	2,208 per year	2,197 00		2,197 00
H. S. Sparr	Assistant engineer	1,980 per year	1,905 00		1,905 00
H. J. Scheuermann	Assistant engineer	2,580 per year	1,722 20	45 35	1,767 55
Rupert Sturtevant	Assistant engineer	2,580 per year	1,802 97	56 87	1,859 84
S. R. Tighe	Assistant engineer	1,980 per year	1,693 16		1,693 16
T. L. Watkins	Assistant engineer	2,340 per year	182 00		182 00

*Construction of Barge Canal — Head Office Account — (Cont'd)*

Chapter 147, Laws of 1933, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
W. J. Weigmann	Assistant engineer	\$2,208 per year	\$2,176 00	\$83 20	\$2,259 20
J. M. Angus	Junior assistant engineer	1,800 per year	1,800 00		1,800 00
Leroy Bamer	Junior assistant engineer	1,440 per year	1,100 00	112 68	1,212 68
J. F. Blaise	Junior assistant engineer	1,800 per year	1,364 52		1,364 52
C. D. Burrus	Junior assistant engineer	1,800 per year	1,485 10		1,485 10
W. A. Dawson	Junior assistant engineer	1,200 per year	915 44		915 44
Bernard Gazier	Junior assistant engineer	1,200 per year	1,011 29		1,011 29
L. Greenaleh	Junior assistant engineer	1,800 per year	1,540 00		1,540 00
H. W. Henderson	Junior assistant engineer	1,440 per year	193 50		193 50
W. J. Henk	Junior assistant engineer	1,440 per year	440 00		440 00
C. E. Hoehn	Junior assistant engineer	1,320 per year	949 77		949 77
E. Hulsmapple	Junior assistant engineer	1,560 per year	303 33	28 51	331 84
J. S. Hyman	Junior assistant engineer	1,800 per year	1,620 00		1,620 00
H. C. Kelly	Junior assistant engineer	1,440 per year	980 00		980 00
G. B. Kelley	Junior assistant engineer	1,560 per year	1,515 75		1,515 75
C. T. Kniskern	Junior assistant engineer	1,560 per year	1,279 61		1,279 61
B. A. Krotzinger	Junior assistant engineer	1,560 per year	185 33		185 33
Jacob Labishiner	Junior assistant engineer	1,110 per year	1,087 50		1,087 50
Thos. MacDonald	Junior assistant engineer	1,560 per year	1,339 08		1,339 08
A. J. Mantica	Junior assistant engineer	1,680 per year	276 03		276 03
G. D. Meer	Junior assistant engineer	1,560 per year	1,542 00	180 23	1,722 23
Chas. Messina	Junior assistant engineer	1,560 per year	1,180 88		1,180 88
P. R. Murray	Junior assistant engineer	1,440 per year	1,260 00		1,260 00
M. L. Neinken	Junior assistant engineer	1,080 per year	101 90		101 90
Paul Scully	Junior assistant engineer	1,320 per year	1,270 00		1,270 00
G. L. Schillner	Junior assistant engineer	1,560 per year	1,550 00		1,550 00
W. L. Shahan	Junior assistant engineer	1,200 per year	112 90		112 90
G. G. Sweet	Junior assistant engineer	1,560 per year	1,565 00		1,565 00
L. E. Turpit	Junior assistant engineer	1,200 per year	493 09		493 09
F. M. Van Zile	Junior assistant engineer	1,560 per year	1,335 00		1,335 00
S. T. Vosburgh	Junior assistant engineer	1,560 per year	1,555 00	561 83	2,116 83
L. B. Westfall	Junior assistant engineer	1,800 per year	1,635 00	40 26	1,675 26
J. H. Williams	Junior assistant engineer	1,560 per year	636 77		636 77
C. P. Wiweke	Junior assistant engineer	1,800 per year	1,573 69		1,573 69
M. E. Baker	Engineering assistant	900 per year	815 00		815 00
J. F. Duffy	Engineering assistant	1,020 per year	966 00		966 00
C. J. Grace, Jr.	Engineering assistant	840 per year	437 50		437 50
A. E. Halligan	Engineering assistant	1,020 per year	769 00		769 00
C. L. Hawkins	Engineering assistant	840 per year	58 33		58 33
W. C. Strecker	Engineering assistant	840 per year	362 50	4 25	366 75
E. V. Allendorph	Inspector of engineering works	1,560 per year	1,565 00		1,565 00
M. S. Bierce	Inspector of engineering works	1,560 per year	1,565 00		1,565 00
F. B. Kraft	Inspector of engineering works	1,560 per year	840 00		840 00
E. H. Wetzel	Inspector of engineering works	1,560 per year	1,565 00		1,565 00
J. P. Adams	Laborer	2 00 per day	140 00		140 00
H. D. Alexander	Laborer	2 00 per day	12 00		12 00
W. J. Atkinson	Laborer	2 50 per day	769 50		769 50
J. H. Brennan	Laborer	2 00 per day	88 00		88 00
John Cullen	Laborer	2 50 per day	662 00		662 00
James Daley	Laborer	3 00 per day	420 00		420 00
James Dolan	Laborer	2 50 per day	660 00		660 00
W. A. Doyle	Laborer	2 50 per day	664 00		664 00
Robert Graves	Laborer	2 00 per day	4 00		4 00
S. Habbinger	Laborer	2 50 per day	660 00		660 00
J. W. Habbinger	Laborer	2 00 per day	24 00		24 00
David Horner	Laborer	2 50 per day	658 00		658 00
Henry Kling	Laborer	2 50 per day	660 00		660 00
Wm. Leffler	Laborer	2 00 per day	208 00		208 00
S. Lodewick	Laborer	2 00 per day	198 00		198 00
Percy Mattimore	Laborer	2 00 per day	36 00		36 00
J. M. MacDonald	Laborer	2 50 per day	660 00		660 00
G. F. Marcoux	Laborer	2 50 per day	590 00		590 00
Filadelfo Mondello	Laborer	2 50 per day	640 00		640 00
C. M. Pepson	Laborer	2 50 per day	674 00		674 00
Thos. Rattoone	Laborer	2 50 per day	682 00		682 00
W. J. Smith	Laborer	2 50 per day	747 50		747 50
H. J. Soules	Laborer	2 50 per day	662 00		662 00
Henry Strobel	Laborer	2 50 per day	662 00		662 00
M. J. Tanner	Laborer	2 50 per day	516 50		516 50
J. R. VanSchoonhoven	Laborer	2 50 per day	615 00		615 00
Agnes Crone	Telephone operator	1,080 per year	450 00		450 00
F. E. Davis	Chauffeur	1,500 per year	625 00	93 74	718 74
Sibella Carroll	Charwoman	1 25 per day	391 25		391 25

*Construction of Barge Canal — Head Office Account — (Concl'd)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
E. M. Chamberlain	Night watchman	\$960 per year	\$960 00		\$960 00
J. J. Finn	Chauffeur	1,500 per year	750 00	\$267 20	1,017 20
F. M. Hill	Title maker	1,560 per year	1,560 00		1,560 00
H. W. Nutter	Chauffeur	1,500 per year	1,500 00	314 65	1,814 65
Theresa M. Stubbing	Telephone operator	720 per year	720 00		720 00
E. N. Burrows	Bridge designer (provisional)	1,800 per year	335 00		335 00
L. C. Urquhart	Bridge designer (provisional)	1,800 per year	335 00		335 00
A. J. Willis	Bridge designer (provisional)	1,800 per year	261 29		261 29
E. E. Briggs	Junior bridge draftsman	1,200 per year	400 00	62 72	462 72
C. M. Hinds	Chainman	2 50 per day	165 00		165 00
J. S. Krause	Chainman	2 50 per day	47 50		47 50
R. M. LeClair	Chainman	2 50 per day	45 00		45 00
A. D. Wilson	Chainman	2 50 per day	27 50		27 50
Moses Kahn	Asseman	2 50 per day	195 00		195 00
<i>Incidental Expenses</i>			\$191,967 90	\$7,419 60	\$199,387 50
Instruments, tools and appliances				\$143 01	
Office rent				4,073 29	
Fuel and light				52 46	
Stationery and printing				6,461 97	
Postage				1,446 48	
Telephone and telegraph				1,701 53	
Miscellaneous				17,083 14	
Total					\$30,941 88
Total					\$230,329 38

*Construction of Barge Canal—Erie Canal*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Geo. D. Williams	Division engineer	\$4,800 per year		\$30 00	\$30 00
E. D. Hendricks	Senior assistant engineer	3,060 per year	\$2,220 75	545 97	2,766 72
E. A. Lamb	Senior assistant engineer	3,060 per year	3,015 00	352 24	3,367 24
D. C. Wedgeworth	Senior assistant engineer	3,060 per year	2,622 11	136 52	2,758 63
P. D. Wendell	Estimate clerk	3,000 per year	2,750 00		2,750 00
John Schade	Cashier	1,800 per year	1,800 00	12 07	1,812 07
G. P. Gleason	Stenographer	2,100 per year	1,775 00	11 55	1,786 55
Edna M. Fickert	Stenographer	1,000 per year	958 32		958 32
J. L. Richards	Stenographer	1,200 per year	1,200 00	12 07	1,212 07
L. R. Spencer	Stenographer	900 per year	900 00	4 30	904 30
H. J. Richardson	Photographer	1,680 per year	900 67	42 47	943 14
A. G. Austin	Assistant engineer	1,980 per year	2,043 00	206 86	2,249 86
T. S. Bailey	Assistant engineer	2,340 per year	2,110 50	368 10	2,478 60
J. C. Bell	Assistant engineer	2,340 per year	2,209 50	248 60	2,458 10
W. C. Benedict	Assistant engineer	2,340 per year	2,302 35	753 41	3,055 76
C. A. Curtis	Assistant engineer	2,340 per year	999 50	141 21	1,140 71
F. W. Harris	Assistant engineer	2,340 per year	1,871 50	117 00	1,988 50
R. L. Holt	Assistant engineer	2,208 per year	1,606 00		1,606 00
Grant Huntley	Assistant engineer	5 00 per day	170 00		170 00
M. E. James	Assistant engineer	2,340 per year	2,426 00	620 61	3,046 61
B. T. Kenyon	Assistant engineer	2,340 per year	2,489 00	643 40	3,132 40
H. C. Kline	Assistant engineer	2,340 per year	1,130 76	126 74	1,257 50
C. A. Lansing	Assistant engineer	6 00 per day	438 00		438 00
T. J. Loonie	Assistant engineer	1,980 per year	1,896 39		1,896 39
A. P. Musi	Assistant engineer	2,208 per year	2,274 00	95 26	2,369 26
C. G. Ranney	Assistant engineer	2,340 per year	2,391 00	518 22	2,909 22
C. R. Waters	Assistant engineer	2,208 per year	673 65	91 72	765 37
T. L. Watkins	Assistant engineer	2,340 per year	1,322 00		1,322 00
L. C. West	Assistant engineer	2,208 per year	2,114 73	200 61	2,315 34
L. J. Bradley	Junior assistant engineer	1,680 per year	1,740 00		1,740 00
J. J. Carroll	Junior assistant engineer	1,110 per year	799 45		799 45

*Construction of Barge Canal—Erie Canal—(Continued)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
R. T. Cavanagh	Junior assistant engineer	\$1,200 per year	\$393 33		\$393 33
W. D. Clark	Junior assistant engineer	1,320 per year	1,123 23		1,123 23
R. E. Crowley	Junior assistant engineer	1,200 per year	86 23		86 23
E. F. Dossert	Junior assistant engineer	1,440 per year	1,336 52		1,336 52
L. W. Douglas	Junior assistant engineer	1,200 per year	112 90		112 90
D. K. Dounn	Junior assistant engineer	1,080 per year	630 00		630 00
H. F. Eagan	Junior assistant engineer	1,440 per year	760 00		760 00
John Edelstein	Junior assistant engineer	1,320 per year	1,366 00		1,366 00
F. B. Faille	Junior assistant engineer	1,440 per year	1,320 00		1,320 00
F. E. Gillen	Junior assistant engineer	1,680 per year	1,755 00		1,755 00
A. A. Griffin	Junior assistant engineer	1,320 per year	1,314 00		1,314 00
W. M. Griffith	Junior assistant engineer	1,680 per year	1,675 00		1,675 00
M. T. Harvey	Junior assistant engineer	1,200 per year	103 23		103 23
H. W. Henderson	Junior assistant engineer	1,440 per year	954 00		954 00
J. W. Hewes	Junior assistant engineer	1,110 per year	1,013 50		1,013 50
H. C. Hoffman	Junior assistant engineer	1,080 per year	85 84		85 84
H. W. Jewell	Junior assistant engineer	1,680 per year	1,594 30	\$8 50	1,602 80
Irwin Kasser	Junior assistant engineer	1,110 per year	369 33		369 33
W. G. Keeshan	Junior assistant engineer	1,110 per year	1,087 50		1,087 50
T. R. Keralake	Junior assistant engineer	1,320 per year	781 00		781 00
L. T. King	Junior assistant engineer	1,440 per year	965 03		965 03
J. F. Larney	Junior assistant engineer	1,080 per year	661 94		661 94
W. H. Mangan	Junior assistant engineer	1,320 per year	1,306 00		1,306 00
A. J. Mantica	Junior assistant engineer	1,680 per year	1,350 42		1,350 42
C. T. MacLean	Junior assistant engineer	1,110 per year	1,063 95		1,063 95
R. V. McKee	Junior assistant engineer	1,080 per year	270 00		270 00
Chas. Montag	Junior assistant engineer	1,560 per year	1,039 62		1,039 62
J. J. Moore	Junior assistant engineer	1,110 per year	816 71		816 71
A. Plonsky	Junior assistant engineer	1,110 per year	650 42		650 42
Harry Posner	Junior assistant engineer	1,080 per year	296 13		296 13
M. J. Quinn	Junior assistant engineer	1,110 per year	1,087 50		1,087 50
W. W. Redfern	Junior assistant engineer	1,080 per year	358 13		358 13
J. F. Ryba	Junior assistant engineer	1,080 per year	80 61		80 61
R. B. Smith	Junior assistant engineer	1,680 per year	1,130 00		1,130 00
Louis Sobell	Junior assistant engineer	1,110 per year	371 75		371 75
Louis Swerdlove	Junior assistant engineer	1,080 per year	58 16		58 16
Geo. Teck	Junior assistant engineer	1,110 per year	493 35		493 35
C. E. Vedder	Junior assistant engineer	1,320 per year	1,135 61		1,135 61
E. M. Vincent	Junior assistant engineer	1,080 per year	46 45		46 45
J. A. Waddell	Junior assistant engineer	1,560 per year	656 43		656 43
C. A. Wilbur	Junior assistant engineer	1,680 per year	1,750 00		1,750 00
L. R. Bailey	Engineering assistant	840 per year	562 50		562 50
W. G. Baxter	Engineering assistant	840 per year	606 37		606 37
A. P. Bayly	Engineering assistant	960 per year	357 00		357 00
F. S. Belotti	Engineering assistant	960 per year	987 00		987 00
E. T. Bright	Engineering assistant	840 per year	599 68		599 68
Moses Buchbinder	Engineering assistant	840 per year	16 33		16 33
A. H. Charchian	Engineering assistant	960 per year	933 42		933 42
R. B. Deutsch	Engineering assistant	840 per year	640 00		640 00
E. E. Forbes	Engineering assistant	840 per year	85 81		85 81
H. H. Glosner	Engineering assistant	840 per year	273 50		273 50
J. B. Kinney	Engineering assistant	840 per year	138 31		138 31
E. M. Lutes	Engineering assistant	840 per year	557 67		557 67
J. C. Quintero	Engineering assistant	840 per year	633 33		633 33
E. C. Reusswig	Engineering assistant	840 per year	555 00		555 00
F. B. Stoddard	Engineering assistant	1,020 per year	1,032 00		1,032 00
Isaac Sugarman	Engineering assistant	840 per year	79 03		79 03
C. B. Tebo	Engineering assistant	1,020 per year	965 17		965 17
Geo. Terwilliger	Engineering assistant	1,020 per year	934 00		934 00
W. L. Weinbender	Engineering assistant	840 per year	602 50		602 50
L. W. Donnelly	Inspector of engineering works	1,560 per year	1,546 04		1,546 04
W. H. H. Klinkhart	Inspector of engineering works	1,560 per year	859 74		859 74
S. Y. MacGregor	Inspector of engineering works	1,560 per year	1,455 00	22 32	1,477 32
T. M. Oliver	Inspector of engineering works	1,560 per year	1,630 00		1,630 00
A. M. Wait	Inspector of engineering works	1,560 per year	1,270 00		1,270 00
E. C. Allen	Laborer	2 00 per day	358 03		358 00
Herman D. Alexander	Laborer	2 00 per day	60 00		60 00
Peter Barton	Laborer	2 50 per day	452 00		452 00
Harry Bramer	Laborer	2 00 per day	38 00		38 00
Raymond Comrie	Laborer	2 50 per day	479 50		479 50
H. L. Crouse	Laborer	2 50 per day	720 50		720 50
Thos Dalton	Laborer	2 50 per day	696 00		696 00

*Construction of Barge Canal — Erie Canal — (Continued)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Wm. DeForest	Laborer	\$2 50 per day	\$477 50		\$477 50
Jas. Dwyer	Laborer	2 00 per day	334 00		334 00
B. K. Ellis	Laborer	2 00 per day	378 00		378 00
Harold Folmesbee	Laborer	2 50 per day	676 50		676 50
Geo. Hinds	Laborer	2 50 per day	572 50		572 50
R. H. Kay	Laborer	2 50 per day	596 00		596 00
Chas. Kershaw	Laborer	2 00 per day	138 00		138 00
John Lavery	Laborer	2 50 per day	769 50		769 50
L. N. Lounsbury	Laborer	2 50 per day	105 00		105 00
Edgar Lynd	Laborer	2 50 per day	105 00		105 00
T. F. Madden	Laborer	2 50 per day	753 50		753 50
Harvey Martin	Laborer	2 50 per day	713 00		713 00
Percy Mattimore	Laborer	2 00 per day	88 00		88 00
Roger MacMillan	Laborer	2 00 per day	94 00		94 00
Milton Mets	Laborer	2 50 per day	769 50		769 50
G. W. Olmstead	Laborer	2 50 per day	65 00		65 00
Geo. Perry	Laborer	2 00 per day	10 00		10 00
R. Platner	Laborer	2 00 per day	128 00		128 00
Paul Sajta	Laborer	2 50 per day	479 50		479 50
John Shook	Laborer	2 00 per day	382 00		382 00
H. F. Sponsable	Laborer	2 00 per day	146 00		146 00
Arthur Wright	Laborer	2 50 per day	142 50		142 50
J. C. Young	Laborer	2 00 per day	10 00		10 00
Stephen Zierak	Laborer	2 50 per day	458 00		458 00
H. S. Deal	Boatman	3 00 per day	1,014 00		1,014 00
J. C. Dunbar	Boatman	3 00 per day	444 00		444 00
J. L. Hayes	Boatman	3 00 per day	939 00		939 00
Richard Murray	Boatman	3 00 per day	708 00		708 00
A. B. Starin	Boatman	3 00 per day	993 00		993 00
Godfrey Aman	Gage reader	7 00 per month	21 00		21 00
Harry Ashton	Gage reader	14 00 per month	32 67		32 67
Sanford Bracebridge	Gage reader	5 00 per month	60 00		60 00
E. M. Brown	Gage reader	5 00 per month	62 50		62 50
H. C. Dowling	Gage reader	7 00 per month	84 00		84 00
P. C. Earl	Gage reader	7 00 per month	84 00		84 00
G. M. Gremier, Jr.	Gage reader	7 00 per month	21 00		21 00
Lloyd Kast	Gage reader	7 00 per month	76 00		76 00
Richard Kilmartin	Gage reader	7 00 per month	84 00		84 00
Leo Laschen	Gage reader	14 00 per month	135 33		135 33
Peter Lebeta	Gage reader	7 00 per month	7 00		7 00
Oscar Lockwood	Gage reader	7 00 per month	63 00		63 00
C. F. Loring	Gage reader	7 00 per month	84 00		84 00
J. B. Mackey	Gage reader	7 00 per month	42 00		42 00
H. Moyer	Gage reader	5 00 per month	2 50		2 50
Jas. Murphy	Gage reader	7 00 per month	84 00		84 00
Fred Pentland	Gage reader	7 00 per month	63 00		63 00
P. C. Pickard	Gage reader	7 00 per month	56 00		56 00
J. Reepmeyer, Jr.	Gage reader	10 00 per month	120 00		120 00
Eugene Snell	Gage reader	7 00 per month	84 00		84 00
A. M. Spencer	Gage reader	7 00 per month	56 00		56 00
W. C. Vrooman	Gage reader	7 00 per month	49 00		49 00
Minnie E. White	Gage reader	7 00 per month	84 00		84 00
Robert Wilson	Gage reader	6 00 per month	80 00		80 00
C. E. Wing	Gage reader	10 00 per month	120 00		120 00
C. W. Young	Gage reader	7 00 per month	140 00		140 00
W. E. Young	Gage reader	7 00 per month	56 00		56 00
A. E. Steere	Resident engineer	3,000 per year	1,854 54	\$162 02	2,016 56
J. C. Podmore	Bridge designer	2,100 per year	565 84		565 84
E. M. Weiskotten	Engineering draftsman	5 00 per day	95 00		95 00
A. W. Fuchs	Junior engineer	1,440 per year	254 58		254 58
E. Hulapple	Leveller	5 00 per day	15 00	10 51	25 51
R. W. Anderson	Rodman	4 00 per day	988 00		988 00
J. A. Daly	Rodman	4 00 per day	920 00		920 00
F. V. Bakeman	Chainman	2 50 per day	170 00		170 00
J. Benjamin	Chainman	2 50 per day	510 00		510 00
Max Frank	Chainman	2 50 per day	200 00		200 00
A. H. Goodman	Chainman	2 50 per day	105 00		105 00
C. J. Grace, Jr.	Chainman	2 50 per day	120 00		120 00
A. I. Howd	Chainman	2 50 per day	345 00		345 00
R. M. LeClair	Chainman	2 50 per day	102 50		102 50
F. B. McLean	Chainman	2 50 per day	355 00		355 00
G. C. Nash	Chainman	2 50 per day	47 50		47 50
E. R. Polley	Chainman	2 50 per day	130 00		130 00

*Construction of Barge Canal — Erie Canal — (Concluded)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
H. S. Roberts	Chairman	\$2 50 per day	\$152 50		\$152 50
R. A. Skinner	Chairman	2 50 per day	195 00		195 00
Adolph Sussman	Chairman	2 50 per day	172 50		172 50
Jos. DeLuca	Axeman	2 50 per day	45 00		45 00
L. H. Frazier	Axeman	2 50 per day	45 00		45 00
G. Gundloff	Axeman	2 50 per day	177 50		177 50
Moses Kahn	Axeman	2 50 per day	262 50		262 50
Adolph Knodel	Axeman	2 50 per day	360 00		360 00
V. J. Lefkowitz	Axeman	2 50 per day	142 50		142 50
A. I. Stein	Axeman	2 50 per day	177 50		177 50
James Sim	Inspector of masonry	5 00 per day	530 00		530 00
<i>Incidental Expenses</i>			\$128,089 66	\$5,482 28	\$133,551 94
Instruments, tools and appliances				\$15 15	
Office rent				2,143 00	
Fuel and light				417 75	
Stationery and printing				12 05	
Postage				167 60	
Telephone and telegraph				676 86	
Miscellaneous				2,589 05	
					6,021 46
Total					\$139,573 40

*Construction of Barge Canal — Champlain Canal*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
E. V. R. Payne	Senior assistant engineer	\$3,060 per year	\$2,217 98	\$1,113 87	\$3,331 85
G. W. Ruso	Clerk	1,900 per year	1,650 00		1,650 00
P. D. Wendell	Estimate clerk	3,000 per year	250 00		250 00
J. E. Phinney	Stenographer	1,200 per year	950 00		950 00
H. J. Richardson	Photographer	1,680 per year	511 00	35 21	546 21
W. L. Caler	Assistant engineer	2,340 per year	1,901 50	110 82	2,011 82
H. L. Clarke	Assistant engineer	2,340 per year	1,488 00	40 10	1,528 10
C. A. Curtis	Assistant engineer	2,340 per year	1,013 50	213 79	1,227 29
J. B. Foote	Assistant engineer	2,340 per year	1,866 00	888 07	2,754 07
R. G. Gibson	Assistant engineer	1,980 per year	1,821 00	138 72	1,959 72
R. D. Hayes	Assistant engineer	2,380 per year	2,115 85	1,152 29	3,268 14
John McBride	Assistant engineer	2,380 per year	2,405 00	278 30	2,683 30
T. L. Watkins	Assistant engineer	7 00 per day	182 00	3 09	185 09
F. F. Baker	Junior assistant engineer	1,320 per year	1,034 00		1,034 00
J. E. Curtin	Junior assistant engineer	1,080 per year	256 26		256 26
D. E. Damon	Junior assistant engineer	1,680 per year	1,217 64		1,217 64
G. E. Deutschbein	Junior assistant engineer	1,680 per year	1,360 00		1,360 00
N. D. Hyde	Junior assistant engineer	1,560 per year	1,299 68		1,299 68
B. A. Krottinger	Junior assistant engineer	1,560 per year	65 00		65 00
J. P. Larsen	Junior assistant engineer	1,110 per year	1,087 50		1,087 50
J. H. McEntee	Junior assistant engineer	1,320 per year	173 87		173 87
G. C. Nash	Junior assistant engineer	1,200 per year	112 90		112 90
Mott Palmer	Junior assistant engineer	1,680 per year	1,637 50	176 91	1,834 41
Louis Sverdlow	Junior assistant engineer	1,090 per year	133 45		133 45
C. A. Thomson	Junior assistant engineer	1,080 per year	405 00		405 00
J. A. Waddell	Junior assistant engineer	1,440 per year	185 81		185 81
H. J. Bristol	Engineering assistant	840 per year	672 00		672 00
W. J. Curtis	Engineering assistant	1,020 per year	972 00		972 00
G. A. Rogers	Engineering assistant	1,020 per year	770 00	4 10	774 10
Thos. Ryan, Jr.	Engineering assistant	900 per year	662 50		662 50
F. W. Yates	Engineering assistant	840 per year	625 00		625 00
F. G. Tilton	Inspector of engineering works	1,560 per year	490 00		490 00
E. G. Clarke	Laborer	2 00 per day	82 00		82 00
F. H. Crandell	Laborer	2 50 per day	568 50		568 50
B. K. Ellis	Laborer	2 00 per day	132 00		132 00
Samuel Friedman	Laborer	2 50 per day	10 00		10 00

*Construction of Barge Canal — Champlain Canal — (Continued)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Fred Hilfinger.....	Laborer.....	\$2 50 per day	\$85 00		\$85 00
Jas. Hughes.....	Laborer.....	2 50 per day	390 50		390 50
Chas. Kershaw.....	Laborer.....	2 00 per day	114 00		114 00
Matthew Killeen.....	Laborer.....	2 50 per day	37 50		37 50
J. F. Malin.....	Laborer.....	2 50 per day	574 00		574 00
Percy Mattimore.....	Laborer.....	2 50 per day	136 00		136 00
John McCarthy, Jr.....	Laborer.....	2 50 per day	431 00		431 00
Geo. McCormack.....	Laborer.....	2 00 per day	30 00		30 00
Harry McMahon.....	Laborer.....	2 50 per day	80 00		80 00
H. F. Scott.....	Laborer.....	2 00 per day	166 00		166 00
John Shook.....	Laborer.....	2 00 per day	132 00		132 00
W. R. Tidmarsh.....	Laborer.....	2 00 per day	140 00		140 00
G. M. Weaver.....	Laborer.....	2 50 per day	516 50		516 50
Willard Joslin.....	Boatman.....	3 00 per day	804 00		804 00
John Keenan.....	Boatman.....	3 00 per day	870 50		870 50
J. C. Leyland.....	Boatman.....	3 00 per day	1,065 00		1,065 00
M. McConnell.....	Boatman.....	3 00 per day	954 00		954 00
G. E. McElroy.....	Boatman.....	3 00 per day	978 00		978 00
N. H. McHard.....	Boatman.....	3 00 per day	1,095 00		1,095 00
Edward Ryan.....	Boatman.....	3 00 per day	213 00		213 00
Geo. Schafer.....	Boatman.....	3 00 per day	1,038 00	\$22 15	1,060 15
W. D. Barber.....	Gage reader.....	7 00 per month	84 00		84 00
E. H. Bowker.....	Gage reader.....	7 00 per month	56 00		56 00
F. E. Chapman.....	Gage reader.....	8 00 per month	96 00		96 00
Chas. Cheney.....	Gage reader.....	7 00 per month	84 00		84 00
S. L. Cluett.....	Gage reader.....	7 00 per month	56 00		56 00
J. H. Donnelly.....	Gage reader.....	7 00 per month	84 00		84 00
W. B. Dunstan.....	Gage reader.....	7 00 per month	84 00		84 00
G. E. Fifield.....	Gage reader.....	7 00 per month	84 00		84 00
A. B. Fisher.....	Gage reader.....	7 00 per month	56 00		56 00
W. H. Handy.....	Gage reader.....	8 00 per month	96 00		96 00
Byron Stedman.....	Gage reader.....	7 00 per month	84 00		84 00
F. H. Wells.....	Gage reader.....	7 00 per month	84 00		84 00
D. C. Wedgeworth.....	Resident engineer.....	3,000 per year		16 80	16 80
D. J. Begley.....	Chainman.....	2 50 per day	300 00		300 00
T. H. Sherman.....	Chainman.....	2 50 per day	197 50		197 50
L. G. Toye.....	Chainman.....	2 50 per day	155 00		155 00
F. B. Kraft.....	Inspector of masonry.....	5 00 per day	395 00		395 00
James Sim.....	Inspector of masonry.....	5 00 per day	465 00		465 00
			\$44,644 94	\$4,193 72	\$48,838 66
<i>Incidental Expenses</i>					
Office rent.....				\$570 00	
Fuel and light.....				83 42	
Stationery and printing.....				42 90	
Postage.....				117 80	
Telephone and telegraph.....				373 09	
Miscellaneous.....				2,026 60	
					3,213 81
Total.....					\$52,052 47

*Construction of Barge Canal Terminals*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
D. B. LaDu.....	Special deputy state engineer.....	\$7,000 per year	\$3,053 33	\$476 92	\$3,560 25
Geo. D. Williams.....	Division engineer.....	4,800 per year		11 50	11 50
Edward Anderberg.....	Senior assistant engineer.....	2,820 per year	2,218 53	409 10	2,627 63
A. W. Conner.....	Senior assistant engineer.....	2,820 per year	2,730 00	54 26	2,784 26
R. S. Greenman.....	Senior assistant engineer.....	3,060 per year		25 80	25 80
E. D. Hendricks.....	Senior assistant engineer.....	3,060 per year	456 99		456 99
E. V. R. Payne.....	Senior assistant engineer.....	3,060 per year	377 50	2 00	379 59
G. G. Underhill.....	Senior assistant engineer.....	3,060 per year	238 81		238 81



*Construction of Barge Canal Terminals— (Continued)*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
D. C. Wedgeworth	Senior assistant engineer	\$3,060 per year	\$392 89	\$33 03	\$425 92
Maurice Williams	Senior assistant engineer	2,820 per year	2,364 00	763 57	3,127 57
B. F. Cresson, Jr.	Expert on terminal construction	40 00 per day	600 00	77 36	677 36
E. P. Goodrich	Expert on terminal construction	40 00 per day	800 00	83 62	883 62
H. McL. Harding	Expert on terminal construction	40 00 per day	800 00	91 48	891 48
R. G. Finch	Chief clerk	4,200 per year		134 11	134 11
G. W. Codwise	Confidential assistant	4,000 per year		65 04	65 04
C. D. Buck	Private secretary	2,400 per year		72 41	72 41
A. H. DeGraff	Private secretary	2,400 per year		106 33	106 33
W. S. Ryan	Confidential clerk and stenographer	2,400 per year		12 00	12 00
F. C. Stahl	Bookkeeper	1,800 per year	1,800 00		1,800 00
J. E. Stewart	Clerk	1,800 per year	1,800 00		1,800 00
G. F. Gleason	Stenographer to division engineer	2,100 per year	175 00		175 00
P. J. Gaffey	Stenographer	1,200 per year	1,200 00		1,200 00
J. E. Phinney	Stenographer	1,200 per year	250 00		250 00
M. J. Sullivan	Stenographer	1,200 per year	1,200 00		1,200 00
H. J. Richardson	Photographer	1,680 per year	231 00	81 49	312 49
J. C. Bell	Assistant engineer	2,340 per year	97 50		97 50
S. R. Bellows	Assistant engineer	2,340 per year	2,244 00	65 21	2,309 21
W. C. Benedict	Assistant engineer	2,340 per year	165 65	31 03	196 73
H. W. Benedict	Assistant engineer	7 00 per day	49 00		49 00
F. E. Blake	Assistant engineer	2,580 per year	657 02		657 02
W. C. Bratton	Assistant engineer	2,208 per year	2,190 87	15 33	2,206 20
P. H. Budd	Assistant engineer	2,208 per year	2,143 53		2,143 53
W. L. Caler	Assistant engineer	2,340 per year	227 50	90 44	317 94
H. L. Clarke	Assistant engineer	2,340 per year	518 00	296 23	814 23
Horace Corbin	Assistant engineer	2,208 per year	2,127 00		2,127 00
N. E. Cottrell	Assistant engineer	6 00 per day	96 00		96 00
C. A. Curtis	Assistant engineer	7 00 per day	448 00	80 70	528 70
J. B. Doughty	Assistant engineer	1,980 per year	1,703 00		1,703 00
Ely Gamse	Assistant engineer	2,340 per year	2,230 00	40 32	2,270 32
R. G. Gibson	Assistant engineer	1,980 per year	132 00	19 03	151 03
H. W. Hale	Assistant engineer	2,208 per year	1,397 40	180 62	1,528 02
F. B. Hall	Assistant engineer	2,340 per year	174 81	16 10	190 91
F. W. Harris	Assistant engineer	2,340 per year	351 50	128 40	479 90
A. G. Hayden	Assistant engineer	2,580 per year	107 50		107 50
R. D. Hayes	Assistant engineer	2,340 per year	198 15	2 25	200 40
L. T. Howard	Assistant engineer	2,340 per year	2,044 85	126 03	2,170 88
Geo. D. Kellogg	Assistant engineer	2,208 per year	94 97		94 97
H. C. Kline	Assistant engineer	2,340 per year	1,148 24	56 51	1,204 75
F. T. Lawton	Assistant engineer	2,208 per year	1,915 75		1,915 75
T. J. Loonie	Assistant engineer	1,980 per year	26 61		26 61
J. B. Maguire	Assistant engineer	2,208 per year	117 48		117 48
J. A. O'Donnell	Assistant engineer	1,980 per year	103 79		103 79
E. C. Olcott	Assistant engineer	2,208 per year	278 97		278 97
D. W. Overacker	Assistant engineer	2,208 per year	351 80	2 85	354 65
A. C. Richards	Assistant engineer	2,208 per year	2,197 00	5 40	2,202 40
L. S. Rickard	Assistant engineer	6 00 per day	18 00		18 00
H. J. Scheuermann	Assistant engineer	2,580 per year	497 80	7 90	505 70
Rupert Sturtevant	Assistant engineer	2,580 per year	487 03	3 71	490 74
S. R. Tighe	Assistant engineer	1,980 per year	211 84		211 84
C. R. Waters	Assistant engineer	2,208 per year	543 35	64 52	607 87
T. L. Watkins	Assistant engineer	2,340 per year	572 00	21 84	593 84
W. J. Weigmann	Assistant engineer	7 00 per day	21 00		21 00
L. C. West	Assistant engineer	2,208 per year	12 27	6 46	18 73
Leroy Bamer	Junior assistant engineer	1,440 per year	120 00		120 00
J. J. Carroll	Junior assistant engineer	1,110 per year	27 05		27 05
J. J. Casey	Junior assistant engineer	1,200 per year	1,015 69		1,015 69
R. E. Crowley	Junior assistant engineer	1,200 per year	26 67		26 67
J. E. Curtin	Junior assistant engineer	1,080 per year	14 52		14 52
J. A. Daly	Junior assistant engineer	1,320 per year	306 15		306 15
W. A. Dawson	Junior assistant engineer	1,200 per year	210 77		210 77
L. A. Denner, Jr.	Junior assistant engineer	1,320 per year	1,197 00		1,197 00
Edward J. Donlon	Junior assistant engineer	1,110 per year	46 25		46 25
E. P. Dossert	Junior assistant engineer	1,440 per year	15 48		15 48
J. A. Galvin	Junior assistant engineer	1,680 per year	1,225 00	2 66	1,227 66
Bernard Gazier	Junior assistant engineer	1,200 per year	188 71		188 71
A. E. Green	Junior assistant engineer	1,680 per year	1,628 75		1,628 75
J. E. Hall	Junior assistant engineer	1,680 per year	1,595 00	4 28	1,599 28
D. L. Hendler	Junior assistant engineer	1,110 per year	202 01		202 01
W. J. Henk	Junior assistant engineer	1,440 per year	820 00		820 00
C. E. Hehn	Junior assistant engineer	1,320 per year	328 23		328 23

*Construction of Barge Canal Terminals— (Continued)*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
H. C. Hoffman.....	Junior assistant engineer.....	\$1,080 per year	\$49 35		\$49 35
N. D. Hyde.....	Junior assistant engineer.....	1,560 per year	120 00		120 00
C. F. Keale, Jr.....	Junior assistant engineer.....	1,440 per year	816 78		816 78
Wm. Kemp, 2nd.....	Junior assistant engineer.....	1,560 per year	1,229 92		1,229 92
B. A. Krottinger.....	Junior assistant engineer.....	1,560 per year	229 67		229 67
Geo. D. Meer.....	Junior assistant engineer.....	1,560 per year	13 00		13 00
D. C. Ogsbury.....	Junior assistant engineer.....	1,680 per year	1,657 50		1,657 50
R. Ruderman.....	Junior assistant engineer.....	1,200 per year	1,121 19		1,121 19
R. B. Smith.....	Junior assistant engineer.....	1,680 per year	495 00	\$122 32	617 32
Louis Sobell.....	Junior assistant engineer.....	1,080 per year	240 00		240 00
Isie Spahn.....	Junior assistant engineer.....	1,110 per year	277 50		277 50
Isaac Stern.....	Junior assistant engineer.....	1,200 per year	83 33		83 33
Louis Swerdlove.....	Junior assistant engineer.....	1,080 per year	78 39		78 39
J. H. Williams.....	Junior assistant engineer.....	1,560 per year	833 23		833 23
W. G. Baxter.....	Engineering assistant.....	840 per year	71 13		71 13
M. Buchbinder.....	Engineering assistant.....	840 per year	9 03		9 03
A. H. Charchian.....	Engineering assistant.....	960 per year	2 58		2 58
A. E. Halligan.....	Engineering assistant.....	1,020 per year	170 00		170 00
J. C. Quintero.....	Engineering assistant.....	840 per year	11 67		11 67
G. A. Rogers.....	Engineering assistant.....	1,020 per year	259 00	2 90	261 90
C. B. Tebo.....	Engineering assistant.....	1,020 per year	36 83		36 83
Geo. Terwilliger.....	Engineering assistant.....	1,020 per year	68 00		68 00
T. J. Torpy, Jr.....	Engineering assistant.....	840 per year	235 92		235 92
L. W. Donnelly.....	Inspector of engineering works.....	1,560 per year	183 96		183 96
W. H. H. Klinkhart.....	Inspector of engineering works.....	1,560 per year	855 26		855 26
Henry Kramer.....	Inspector of engineering works.....	1,560 per year	1,539 00		1,539 00
A. M. Wait.....	Inspector of engineering works.....	1,560 per year	65 00		65 00
Peter Barton.....	Laborer.....	2 00 per day	102 00		102 00
Archie Bellrose.....	Laborer.....	2 50 per day	112 50		112 50
Harry Bramer.....	Laborer.....	2 00 per day	20 00		20 00
Walter Corman.....	Laborer.....	2 50 per day	30 00		30 00
Sylvester Cogley.....	Laborer.....	2 50 per day	107 50		107 50
B. K. Ellis.....	Laborer.....	2 50 per day	179 00		179 00
Chas. Girard.....	Laborer.....	2 50 per day	765 50		765 50
H. H. Glosner.....	Laborer.....	2 00 per day	20 00		20 00
Jas. Hopkins.....	Laborer.....	2 50 per day	689 00		689 00
David Horner.....	Laborer.....	2 00 per day	4 00		4 00
E. B. Male.....	Laborer.....	2 50 per day	568 00		568 00
Percy Mattimore.....	Laborer.....	2 00 per day	40 00		40 00
Leonard Paige.....	Laborer.....	2 00 per day	368 00		368 00
G. L. Reuling.....	Laborer.....	2 50 per day	564 50		564 50
Julius Schwimmer.....	Laborer.....	2 00 per day	312 00		312 00
John Shook.....	Laborer.....	2 50 per day	239 00		239 00
Gilbert Venter.....	Laborer.....	2 50 per day	745 50		745 50
Geo. Alexander.....	Boatman.....	3 00 per day	18 00		18 00
A. A. Boles.....	Boatman.....	3 00 per day	951 00		951 00
T. J. Burns, Jr.....	Boatman.....	3 00 per day	702 00		702 00
Louis Cicio.....	Boatman.....	3 00 per day	703 00		703 00
Ruby Cohen.....	Boatman.....	3 00 per day	918 00		918 00
Lawrence Goodman.....	Boatman.....	3 00 per day	663 00		663 00
J. A. Jacobson.....	Boatman.....	3 00 per day	1,038 00		1,038 00
J. J. Kelly.....	Boatman.....	3 00 per day	1,065 00		1,065 00
R. Murray.....	Boatman.....	3 00 per day	3 00		3 00
H. F. O'Neil.....	Boatman.....	3 00 per day	522 00		522 00
E. W. Reilly.....	Boatman.....	3 00 per day	1,080 00		1,080 00
J. J. Rice.....	Boatman.....	3 00 per day	729 00		729 00
M. J. Sims.....	Boatman.....	3 00 per day	1,090 00		1,090 00
W. L. Trecartin.....	Boatman.....	3 00 per day	492 00		492 00
Joe Turner.....	Boatman.....	3 00 per day	54 00		54 00
Bernard Wasage.....	Boatman.....	3 00 per day	885 00		885 00
F. E. Davis.....	Chauffeur.....	1,500 per year	875 00	272 35	1,147 35
J. J. Finn.....	Chauffeur.....	1,500 per year	750 00	103 52	853 52
H. W. Nutter.....	Chauffeur.....	1,500 per year	45 38		45 38
Henry Auerbach.....	Bridge designer.....	2,100 per year	114 78		114 78
E. A. Brainerd.....	Bridge designer.....	2,400 per year	240 00		240 00
A. G. Hayden.....	Bridge designer.....	2,400 per year	177 42		177 42
J. C. Podmore.....	Bridge designer.....	2,100 per year	612 50		612 50
C. E. Quimby.....	Bridge designer.....	1,800 per year	240 00		240 00
E. G. Semon.....	Bridge designer.....	2,100 per year	90 32		90 32
R. R. Shearer.....	Bridge designer (provisional).....	1,500 per year	279 17		279 17
Thos. MacDonald.....	Bridge draftsman.....	1,201 per year	100 08		100 08
E. E. Briggs.....	Junior bridge draftsman.....	1,200 per year	100 00		100 00
F. M. VanZile.....	Junior bridge draftsman.....	1,200 per year	30 00		30 00

*Construction of Barge Canal Terminals — (Concluded)*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
C. P. Wiweke.....	Mechanical draftsman.....	\$1,800 per year	\$226 31		\$226 31
G. D. Meer.....	Engineering draftsman.....	5 00 per day	10 00	\$33 93	33 93
S. T. Voeburgh.....	Engineering draftsman.....	5 00 per day	20 00		20 00
L. Greenalch.....	Leveler.....	5 00 per day	15 00		15 00
A. F. Bayly.....	Chainman.....	3 00 per day	24 00		24 00
J. S. Krauss.....	Chainman.....	2 50 per day	67 50		67 50
D. E. Damon.....	Junior engineer.....	1,550 per year		22 92	22 92
A. J. Mantica.....	Junior engineer.....	1,550 per year	22 18		22 18
J. A. Waddell.....	Junior engineer.....	1,440 per year	130 32		130 32
F. B. Kraft.....	Inspector of masonry.....	5 00 per day	385 00		385 00
James Sim.....	Inspector of masonry.....	5 00 per day	200 00		200 00
A. M. Wait.....	Inspector of public works.....	5 00 per day	380 00		380 00
			\$89,245 83	\$4,311 21	\$93,557 04
<i>Incidental Expenses</i>					
Instruments, tools and appliances.....				\$24 38	
Office rent.....				3,975 00	
Fuel and light.....				199 93	
Stationery and printing.....				1,037 07	
Postage.....				115 76	
Telephone and telegraph.....				491 16	
Express and freight.....				48 40	
Miscellaneous.....				4,909 88	
					10,801 58
Total.....					\$104,358 62

*Bridge Designers, Engineers, Etc.*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
H. E. Brainard.....	Assistant engineer.....	\$2,580 per year	\$1,625 00	\$136 12	\$1,761 12
W. S. McDowell.....	Bridge designer.....	2,100 per year	175 00		175 00
Total.....			\$1,800 00	\$136 12	\$1,936 12

*Improvement of Albany Basin*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
F. W. Harris.....	Assistant engineer.....	\$7 00 per day	\$196 00	\$48 97	\$244 97
J. E. Curtin.....	Jun or assistant engineer.....	1,080 per year	179 22		179 22
Percy Mattimore.....	Laborer.....	2 00 per day	116 00		116 00
J. C. Podmore.....	Bridge designer.....	2,100 per year	46 66		46 66
			\$537 88	\$48 97	\$586 85
<i>Incidental Expenses</i>					
Fuel and light.....				\$1 00	
Postage.....				50	
Telephone and telegraph.....				6 45	
Miscellaneous.....				7 67	
					15 62
Total.....					\$602 47

*Improvement of Mohawk River and West Canada Creek*

Chapter 245, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917

NAME	Rank	Rate of compensation	Services	Travel	Total
C. G. Ranney.....	Assistant engineer.....	\$7 00 per day	\$56 00	\$19 79	\$75 79
J. J. Moore.....	Junior assistant engineer.....	1,080 per year	8 71		8 71
Geo. Toek.....	Junior assistant engineer.....	1,080 per year	2 90		2 90
H. W. Jewell.....	Junior engineer.....	1,650 per year	63 20		63 20
Charles Montag.....	Junior engineer.....	1,501 per year	12 10		12 10
J. Hayes.....	Boatman.....	3 00 per day	96 00		96 00
E. M. Lutes.....	Chainman.....	2 50 per day	13 00		13 00
Wm. Mangan.....	Boatman.....	4 00 per day	36 00		36 00
F. V. Bakeman.....	Chainman.....	2 50 per day	5 00		5 00
A. Susman.....	Chainman.....	2 50 per day	5 00		5 00
S. Y. MacGregor.....	Inspector of masonry.....	5 00 per day	245 00		245 00
Total.....			\$542 91	\$19 79	\$562 70

*Schenectady-Scotia Bridge*

Chapter 735, Laws of 1917

NAME	Rank	Rate of compensation	Services	Travel	Total
C. H. Wood.....	Senior assistant engineer.....	\$3,020 per year	\$70 50		\$70 50
J. M. Prior.....	Assistant engineer.....	1,980 per year	44 00		44 00
L. Greenaloh.....	Junior assistant engineer.....	1,800 per year	70 00		70 00
J. S. Hyman.....	Junior assistant engineer.....	1,800 per year	30 00		30 00
Thomas MacDonald.....	Junior assistant engineer.....	1,560 per year	26 00		26 00
Charles Messina.....	Junior assistant engineer.....	1,560 per year	34 67		34 67
Total.....			\$275 17		\$275 17

*Construction of Lock, Shinnecock and Peconic Canal*

Chapter 728, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
R. L. Holt.....	Assistant engineer.....	\$6 00 per day	\$120 00	\$101 32	\$221 32
F. B. Hall.....	Assistant engineer.....	7 00 per day	153 98		153 98
H. C. Kelly.....	Engineering draftsman.....	4 00 per day	24 00		24 00
W. C. Strecker.....	Chainman.....	2 50 per day	38 00		38 00
Robert C. Brenner.....	Boatman.....	3 00 per day	30 00		30 00
Harry Hand.....	Boatman.....	3 00 per day	6 00		6 00
Ellsworth Howland.....	Boatman.....	3 00 per day	6 00		6 00
John Raynor.....	Boatman.....	3 00 per day	6 00		6 00
B. F. Raynor.....	Boatman.....	3 00 per day	6 00		6 00
Geo. W. Rockefeller.....	Boatman.....	3 00 per day	6 00		6 00
<i>Incidental Expenses</i>			\$365 98	\$101 32	\$467 30
Postage.....				\$0 20	
Miscellaneous.....				2 50	
Total.....					\$500 00

*Improvement of Three-Mile Harbor*

Chapter 247, Laws of 1914; chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
R. L. Holt.....	Assistant engineer.....	\$6 00 per day	\$324 00	\$3 07	\$332 07
Ulysses Lee.....	Boatman.....	3 00 per day	156 00		156 00
Burton Miller.....	Laborer.....	2 00 per day	4 00		4 00
<i>Incidental Expenses</i>			\$484 00	\$8 07	\$492 07
Miscellaneous.....					27 50
Total.....					\$519 57

*Blue Line Surveys*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
W. C. Benedict.....	Assistant engineer.....	\$7 00 per day	\$7 00		\$7 00
J. B. Foote.....	Assistant engineer.....	7 00 per day	483 00		483 00
Edwin Hilborn.....	Assistant engineer.....	2,340 per year	1,990 97	\$571 34	2,562 31
O. F. Lewis.....	Assistant engineer.....	7 00 per day	1,519 00	3 71	1,522 71
C. R. Waters.....	Assistant engineer.....	7 00 per day	987 00	151 24	1,138 24
J. H. Bovier.....	Junior assistant engineer.....	1,560 per year	1,367 26		2,927 26
L. E. Fields.....	Junior assistant engineer.....	1,200 per year	608 39		608 39
D. L. Hendler.....	Junior assistant engineer.....	1,080 per year	710 24		710 24
H. C. Hoffman.....	Junior assistant engineer.....	1,080 per year	169 65		169 65
Irwin Kasser.....	Junior assistant engineer.....	1,080 per year	579 19		579 19
Chas. T. Kniakern.....	Junior assistant engineer.....	1,560 per year	85 39		85 39
Michael Kovar.....	Junior assistant engineer.....	1,080 per year	476 13		476 13
W. W. Rodfarn.....	Junior assistant engineer.....	1,080 per year	109 29		109 29
Louis Sobell.....	Junior assistant engineer.....	1,080 per year	45 00		45 00
Isie Spahn.....	Junior assistant engineer.....	1,080 per year	484 52		484 52
J. J. Raup.....	Engineering assistant.....	1,020 per year	850 32		850 32
Peter Barton.....	Laborer.....	2 00 per day	122 00		122 00
Harry Bramer.....	Laborer.....	2 00 per day	348 00		348 00
F. H. Crandall.....	Laborer.....	2 00 per day	150 00		150 00
Wm. Elkins.....	Laborer.....	2 00 per day	122 00		122 00
H. H. Glosser.....	Laborer.....	2 00 per day	370 00		370 00
C. H. Green.....	Laborer.....	2 00 per day	108 00		108 00
Robert Harmon.....	Laborer.....	2 00 per day	52 00		52 00
F. J. Hilgner.....	Laborer.....	2 50 per day	561 00		561 00
J. P. Hoolcy.....	Laborer.....	2 50 per day	38 00		38 00
Jas. F. Malin.....	Laborer.....	2 00 per day	122 00		122 00
Geo. McCormick.....	Laborer.....	2 00 per day	318 00		318 00
R. Murray.....	Boatman.....	3 00 per day	231 00		231 00
H. C. Kelly.....	Engineering draftsman.....	4 00 per day	100 00		100 00
Geo. L. Schillner.....	Engineering draftsman.....	5 00 per day	25 00		25 00
D. E. Damon.....	Junior engineer.....	1,650 per year	368 15		368 15
A. W. Fuchs.....	Junior engineer.....	1,440 per year	148 00		148 00
Geo. E. Deutschbein.....	Leveeler.....	5 00 per day	345 00		345 00
B. A. Krottinger.....	Leveeler.....	5 00 per day	1,085 00		1,085 00
W. D. Clark.....	Rodman.....	4 00 per day	4 00		4 00
L. C. Case.....	Rodman.....	4 00 per day	309 50		309 50
E. F. Dossert.....	Rodman.....	4 00 per day	8 00		8 00
T. R. Kerslake.....	Rodman.....	3 50 per day	423 50		423 50
A. F. Bayly.....	Chainman.....	3 00 per day	567 00		567 00
Harold I. Bristol.....	Chainman.....	2 50 per day	172 50		172 50
H. O. Doggett.....	Chainman.....	2 50 per day	12 50		12 50
A. H. Goodman.....	Chainman.....	2 50 per day	67 50		67 50
F. B. McLean.....	Chainman.....	2 50 per day	5 00		5 00
F. W. Yates.....	Chainman.....	2 50 per day	172 50		172 50

*Blue Line Surveys— (Continued)*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Thos. Ryan, Jr.	Axeman	\$2 50 per day	\$172 50		\$172 50
L. W. Donnelly	Inspector of masonry	5 00 per day	15 00		15 00
F. G. Tilton	Inspector of masonry	5 00 per day	1,085 00		1,085 00
<i>Incidental Expenses</i>			\$17,900 00	\$726 29	\$18,626 29
Livery				\$1,069 00	
Office rent				90 00	
Fuel and light				62 16	
Stationery and printing				9 15	
Postage				8 92	
Telephone and telegraph				39 60	
Miscellaneous				994 88	
					2,273 71
Total					\$20,900 00

*Examination of Monuments and Maps*

Chapter 530, Laws of 1914; chapter 728, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
G. W. Codwise	Confidential assistant	\$4,000 per year		\$54 04	\$54 04
H. F. Egan	Junior assistant engineer	1,440 per year	\$341 55	639 17	980 72
Edward Canavan	Laborer	2 00 per day	88 00		88 00
Melvin Hoffman	Laborer	2 50 per day	145 50		145 50
Theodore Melius	Laborer	2 50 per day	145 50		145 50
G. F. Marcoux	Laborer	2 50 per day	70 00		70 00
John O'Hara	Laborer	2 50 per day	118 00		118 00
<i>Incidental Expenses</i>			\$908 55	\$693 21	\$1,601 76
Livery				\$290 50	
Postage				50	
Miscellaneous				247 08	
					538 08
Total					\$2,139 84

*State Boundary Line*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
H. F. Egan	Junior assistant engineer	\$1,440 per year	\$242 45	\$182 88	\$425 33
R. G. Finch	Chief clerk	4,200 per year		52 05	52 05
<i>Incidental Expenses</i>			\$242 45	\$234 93	\$477 38
Livery				\$37 00	
Stationery and printing				75	
Postage				25	
Miscellaneous				199 51	
					237 51
Total					\$714 89

*Compiling Old Records*

Chapter 521, Laws of 1914; chapter 728, Laws of 1915

Incidental expenses—stationery and printing..... \$840 00

*Topographic Survey*

Chapter 646, Laws of 1916

In coöperation with United States Geological Survey

C. A. Allen.....	\$28 88
C. E. Bates.....	256 88
G. H. Bosian.....	178 67
C. P. Claxton.....	173 00
G. M. Farney.....	413 00
M. Foley.....	42 00
G. H. Guerdum.....	545 32
Peter Gebo.....	44 00
Thos. F. Hogan.....	38 00
E. B. Hill.....	310 28
Chester W. Ingelhart.....	44 98
Ulysses Janack.....	28 33
G. S. Jones.....	344 50
Daniel Kearney.....	173 00
C. B. Kendall.....	560 49
William J. Kirby.....	104 83
J. J. LaFleur.....	85 00
W. J. Lloyd.....	179 09
R. M. Lines.....	28 50
A. P. Meade, Jr.....	1,162 50
Thomas Brandon Munroe.....	18 00
E. D. Monroe.....	128 50
W. H. S. Morey.....	519 66
Robert Parmelee.....	46 65
S. Spain.....	66 25
K. E. Schlachter.....	438 88
F. L. Shalibo.....	455 25
W. R. Smith.....	153 17
W. P. Fague.....	44 00
J. M. Whitman, Jr.....	1,374 60
Total.....	<u>\$7,986 21</u>

*Hydrographic Survey*

Chapter 646, Laws of 1916

In coöperation with United States Geological Survey

Cora Ames.....	\$15 0 0
W. O. Birdsall.....	24 00
E. D. Burchard.....	110 00
C. C. Covert.....	556 58
W. E. Coe.....	15 00
A. H. Davison.....	100 00
Bella Fuller.....	9 00
O. W. Hartwell.....	205 00
Erastus Ingraham.....	15 00
W. A. James.....	24 00
Helen Kimmey.....	76 00
James Lyons.....	6 00
New York Telephone Co.....	42 20
D. L. Orcutt.....	12 00
J. L. Ross.....	15 00
Mrs. Vashti Russell.....	12 00
William Seeley.....	12 00
Total.....	<u>\$1,248 78</u>

## SUMMARY

The foregoing tables are summarized as follows:

*Ordinary Repairs to Canals*

1. Erie canal, chapter 646, Laws of 1916.....	\$8,440 48
2. Champlain canal, chapter 646, Laws of 1916.....	3,559 52

*Construction of Barge Canal*

3. Head office account, chapter 147, Laws of 1903, and amendatory laws.....	230,322 38
4. Erie canal, chapter 147, Laws of 1903, and amendatory laws.....	139,573 40
5. Champlain canal, chapter 147, Laws of 1903, and amendatory laws.....	52,052 4 7

*Construction of Barge Canal Terminals*

6. Barge canal terminals, chapter 746, Laws of 1911, and amendatory laws.....	104,358 62
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*Bridge Designers, Engineers, Etc.*

7. Bridge designers, engineers, etc., chapter 646, Laws of 1916.....	1,936 12
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*Special Work*

8. Improvement of Albany basin, chapter 646, Laws of 1916.....	602 47
9. Improvement of Mohawk river and West Canada creek, chapter 245, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917.....	562 70
10. Schenectady-Scotia bridge, chapter 735, Laws of 1917.....	275 17
11. Construction of lock, Shinnecock and Peconic canal, chapter 728, Laws of 1915.....	500 00
12. Improvement of Three-Mile harbor, chapter 247, Laws of 1914; chapter 646, Laws of 1916...	519 57

*Special Surveys*

13. Blue line surveys, chapter 646, Laws of 1916.....	20,900 00
14. Examination of monuments and maps, chapter 530, Laws of 1914; chapter 728, Laws of 1915.....	2,139 84
15. State boundary line, chapter 646, Laws of 1916.....	714 89
16. Compiling old records, chapter 521, Laws of 1914; chapter 728, Laws of 1915.....	840 00
17. Topographic survey, chapter 646, Laws of 1916.....	7,986 21
18. Hydrographic survey, chapter 646, Laws of 1916.....	1,248 78

Total.....	<u><u>\$574,539 62</u></u>
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TABLE OF CONTRACTS COMPLETED ON THE EASTERN DIVISION DURING THE FISCAL YEAR ENDED  
JUNE 30, 1917  
*Special Work*

CONTRACTOR	Date of contract	Character of work	Act		Appropriation	Engineer's Preliminary estimate	Contract price as modified by alterations	Final payment
			Chap.	Year				
Lupfer & Remick.....	Sept. 8, 1914	Construction of a highway bridge over the canalized Mohawk river at movable dam No. 5, between the towns of Glenville and Rotterdam, Schenectady county.....	714	1913	\$50,000 00	\$44,670 00	\$42,976 00	\$39,861 43
State Highway Construction Co., Inc.....	Oct. 26, 1915	Improvement of the Mohawk river and West Canada creek.....	728	1915	*11,833 32	8,240 00	6,640 00	5,927 00
			181	1917				
			245	1913				
			728	1915				
J. S. Packard Dredging Co.....	Mar. 23, 1916	Improvement of Three-Mile harbor.....	181	1917	10,000 00	8,500 00	8,500 00	8,213 00
			247	1914				
Harry H. Tuthill.....	April 1, 1916	Rebuilding Fire Island State Park dock....	646	1916	4,000 00	3,794 80	3,647 50	3,559 01
			727	1915				
			181	1917				

\* Reappropriation of unexpended balance from chapter 132, Laws of 1911.

*Construction of the Barge Canal*  
Chapter 147, Laws of 1903, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
New York State Dredging Corporation.....	Feb. 17, 1914	Contract No. 18-A, Erie canal — Mindenville to Little Falls.....	\$1,591,536 36	\$1,698,784 21	\$1,668,069 38
American Pipe & Construction Co. ....	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Rexford Flats to Yosts.....	2,260,000 00	3,151,104 40	3,148,447 74
John J. Farrell, Jr. ....	May 23, 1916	Contract No. 27-B, Champlain canal — Constructing a diversion channel for Bond creek, near lock No. 8.....	9,725 00	6,845 00	6,042 52
Acme Engineering & Contracting Co. ....	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek.....	2,650,500 00	2,751,261 12	2,911,229 68
James Stewart & Co., Inc.*.....	Mar. 27, 1913	Contract No. 72-A, Champlain canal — Hudson river, lower Mechanieville to Stillwater.....	1,396,585 50	1,534,603 25	1,515,095 31
Lathrop, Shea & Henwood Co. ....	July 29, 1914	Contract No. 118, Erie canal — Highway bridge at Amsterdam.....	153,093 00	154,806 00	152,580 17
Whitehead & Kales Iron Works.....	July 29, 1914	Contract No. 120, Erie canal — Reinforcement of movable dams, Nos. 5 to 11, inclusive.....	273,484 00	265,954 00	279,750 04
Great Lakes Dredge & Dock Co. ....	April 3, 1916	Contract No. 130, Erie canal — Improvement of Albany basin.....	9,000 00	7,140 00	5,506 37
Holler & Shepard.....	Nov. 1, 1916	Contract No. 140, Champlain canal — Protection on west shore of Hudson river, five miles north of Waterford.....	5,454 50	4,559 00	4,855 94
Horseheads Construction Co. ....	Jan. 4, 1917	Contract No. 145, Erie canal — Raising highway bridge at Schenectady.....	5,092 00	3,978 00	3,765 08
James McKinney & Son.....	Mar. 22, 1917	Contract No. 158, Erie canal — Barrel buoys and lamp posts.....	†3,852 00	†3,127 00	†3,127 00

\* Relet to complete former contract.

† Figures include portion in Middle Division.

TABLE OF CONTRACTS COMPLETED ON THE EASTERN DIVISION DURING THE FISCAL YEAR ENDED JUNE 30,  
1917 — (Continued)

*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
John Shaw & Irving L. Taylor.....	May 20, 1916	Erie canal — Improvement of highway between Mohawk river and the Erie canal at Forts Ferry, town of Clifton Park, Saratoga county.....	\$3,915 00	\$3,210 50	\$2,495 85
Holler & Shepard.....	Sept. 8, 1916	Champlain canal — Relocating the highway east of the Hudson river, north of Moses kill, adjacent to Contract No. 1-A.....	3,090 60	3,090 60	2,797 36

*Construction of Barge Canal Terminals*  
Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Patrick W. Mulderry.....	Nov. 12, 1915	Terminal contract No. 2-P — Paving terminal at Albany	\$42,869 00	\$32,072 90	\$30,496 70
Geo. W. Rogers & Co., Inc.....	July 15, 1914	Terminal contract No. 18 — Dredging and constructing bulkheads and sewer at Gowanus bay.....	365,707 00	326,880 35	304,661 48
Collins Brothers.....	Dec. 29, 1916	Terminal contract No. 203 — Warehouses at Troy, Mechanicville, Fort Edward and Fort Henry.....	3,605 00	3,244 55	3,093 78

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, JUNE 30, 1917  
*Construction of the Barge Canal*  
 after 147, Laws of 1903, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Holler & Shepard*	Aug. 31, 1914	Contract No. 1-A, Champlain canal — Hudson river, Northumberland to Fort Miller and Crockers Reef to Fort Edward.	\$80,811 00	\$133,095 40	\$182,540 00
A. A. Parker	Oct. 17, 1916	Contract No. 2-G, Erie canal — Spillway, Taintor gate and operating equipment, Waterford side-cut.	9,686 00	11,769 85	11,260 00
Eastover Construction Co.*	Mar. 27, 1916	Contract No. 29-A, Erie canal — Completing the canal from Sterling creek to Herkimer-Onondaga county line.	162,005 00	318,659 70	159,380 00
Mohawk Dredge & Dock Co.*	Nov. 24, 1916	Contract No. 30-A, Erie canal — Completing the canal from Jacksonville to Herkimer.	122,013 00	128,182 00	79,610 00
Central Dredging Co.*	Oct. 22, 1912	Contract No. 70-A, Champlain canal — Hudson river, Waterford to lock No. 1.	790,488 00	769,158 88	751,490 00
James Stewart & Co., Inc.	July 7, 1916	Contract No. 72-B, Champlain canal — Widening prism at mouth of Hoosic river.	207,700 00	108,540 00	91,100 00
Great Lakes Dredge & Dock Co.*	Jan. 15, 1916	Contract No. 73-A, Champlain canal — Completing the canal from Northumberland to Stillwater.	432,045 00	458,265 67	318,140 00
Dunbar & Sullivan Dredging Co.	Feb. 13, 1914	Contract No. 74, Erie canal — Hudson river and Mohawk river at Waterford.	266,372 00	240,872 00	200,670 00
The Holington Co.	Jan. 5, 1911	Contract No. 91, Erie canal — Hydro-electric power-plant at Crescent dam.	44,600 00	44,985 50	43,710 00
Lord Construction Co.	Nov. 24, 1916	Contract No. 91-A, Erie canal — New governor equipment for hydro-electric power-plant at Crescent dam.	6,310 00	5,930 00	5,350 00
Thomas Leonard	Feb. 23, 1916	Contract No. 122, Erie canal — Highway bridge near Little Falls.	59,339 50	56,615 00	6,090 00
Chesley, Earl & Heimbach Inc.*	Mar. 8, 1917	Contract No. 122-A, Erie canal — Completing highway bridge near Little Falls.	52,717 00	67,053 10	3,230 00
Holler & Shepard	May 27, 1916	Contract No. 128, Champlain canal — Highway bridge at Northumberland.	77,751 50	76,486 70	59,210 00
The Foundation Co.	June 6, 1916	Contract No. 129, Erie canal — Freeman's bridge.	80,976 50	88,470 80	35,340 00
Spaulding Construction Co.	Mar. 28, 1916	Contract No. 131, Champlain canal — Portions of a highway bridge at Schuylerville.	31,248 00	29,734 00	850 00

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, JUNE 30, 1917 — (Continued)  
*Construction of the Barge Canal — (Continued)*

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
M. Fitzgerald*	Mar. 5, 1917	Contract No. 131-A, Champlain canal — Completing portions of a highway bridge at Schuylerville.	\$30,753 00	†39,634 50	‡420 00
Morrison & Quinn, Inc.	Oct. 16, 1916	Contract No. 133, Erie canal — Junction lock at Mohawk.	47,534 00	48,638 80	36,820 00
Great Lakes Dredge & Dock Co.	Sept. 18, 1916	Contract No. 135, Erie canal — Widening the prism at Canajoharie.	78,052 00	57,038 00	39,220 00
J. A. Laporte	Oct. 13, 1916	Contract No. 137, Erie canal — Sheet-piling at dam No. 10, Canajoharie.	25,333 00	22,650 00	13,170 00
Brown & Lowe Co.	Dec. 1, 1916	Contract No. 150, Erie canal — Apron below head-gates at Vischer Ferry dam.	20,300 00	21,780 00	20,980 00
R. B. Wing & Son.	Feb. 28, 1917	Contract No. 153, Erie and Oswego canals — Buoy, stake and bridge lanterns on the Mohawk, Oneida, Seneca and Oswego rivers.	‡4,200 00	‡4,389 00	0 00
Lupfer & Remick	Jan. 31, 1917	Contract No. 156, Erie canal — Hoists for bulkhead gates, Vischer Ferry dam.	9,998 00	11,586 00	2,850 00
Holler & Shepard	June 28, 1917	Contract No. 169, Champlain canal — Temporary cribs below locks Nos. 3 and 6.	3,508 00	3,066 00	0 00

\* Relet to complete former contract.

† Part of this bridge was built under contract No. 8.

‡ Figures include portion in Middle Division.

*Construction of Barge Canal Terminals*  
Chapter 746, Laws of 1911, and amendatory laws.

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Kendar Engineering & Construction Corp., Inc.	Dec. 29, 1914	Terminal contract No. 13 — Guard-lock, highway bridge and cut-off dam at Schuylerville.	\$61,664 00	\$42,742 80	*\$38,190 00
McHarg-Barton Co.	Nov. 24, 1916	Terminal contract No. 19 — Dredging and constructing bulkhead wall and pier, and repairing two piers and a bulkhead at Greenpoint.	193,500 00	207,383 00	25,280 00
John E. Byron & Co.	Oct. 30, 1916	Terminal contract No. 26 — Dredging and constructing pier at Rouses Point.	51,200 00	55,678 50	4,010 00
Troy Public Works Co.	Mar. 27, 1917	Terminal contract No. 36 — Dredging and dockwall at Cohoes.	61,000 00	57,900 00	0 00
Holler & Shepard.	Aug. 26, 1915	Terminal contract No. 37 — Dockwall and harbor at Canajoharie.	33,832 00	32,272 00	13,380 00
Scott Bros.	Sept. 20, 1915	Terminal Contract No. 40 — Dockwall and harbor at St. Johnsville.	27,963 00	27,702 37	22,980 00
Geo. W. Rogers Co., Inc.	June 8, 1917	Terminal contract No. 44 — Terminal at Mott Haven.	170,300 00	193,651 00	20,680 00
Kaufman & Gareey.	July 27, 1916	Terminal contract No. 52 — Terminal at Pier 6, East river, New York city.	89,974 00	109,357 75	53,660 00
E. Brown Baker	Dec. 18, 1916	Terminal contract No. 101 — Stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda.	421,890 90	431,790 90	0 00
J. A. Laporte.	Jan. 2, 1917	Terminal contract No. 201 — Terminal warehouses at Albany and Whitehall.	59,300 00	65,174 85	2,530 00
Kennedy & Scullen.	Mar. 12, 1917	Terminal contract No. 204 — Temporary terminal warehouses at Schenectady, Amsterdam, Fonda, Ilion and Frankfort.	4,765 00	19,000 00	18,470 00
Kennedy & Scullen Construction Co.	May 7, 1917	Terminal contract No. 208 — Temporary terminal warehouses at Fort Plain and Little Falls.	9,140 00	9,278 75	8,820 00

\* Terminal contract No. 13, was suspended by the Canal Board, February 23, 1916. The work on this contract has all been done by the Superintendent of Public Works.

† Figures include portions in Middle and Western Divisions.

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# REPORT

OF THE

## DIVISION ENGINEER

OF THE

## MIDDLE DIVISION

For the Fiscal Year Ended June 30, 1917

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[191]





## MIDDLE DIVISION

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STATE OF NEW YORK

DEPARTMENT OF STATE ENGINEER AND SURVEYOR

MIDDLE DIVISION

SYRACUSE, N. Y., July 2, 1917.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor,*  
*Albany, N. Y.:*

Sir.—I have the honor of submitting herewith my annual report as Division engineer of the Middle Division of the New York State canals for the fiscal year ended June 30, 1917.

Navigation on the Erie canal has been continuous throughout the season. On the Oswego canal navigation has been open through the Barge canal to Mud lock and thence through the old canal to Syracuse. Owing to Barge canal construction, navigation on the Cayuga and Seneca canal was not open until July 1, 1916, but was not interrupted the rest of the season.

Senior Assistant Engineer E. J. Berry, with offices in the Weigh Lock building, Syracuse, has had charge of all work pertaining to special appropriations, claims on the old canals and the blue line work. Mr. Berry has also looked after the claims on property adjacent to Oneida river and Oneida lake.

### BARGE CANAL CONSTRUCTION

The Middle Division includes the Erie branch of the Barge canal, extending from the east line of Oneida county to the south line of Wayne county, a distance, including Oneida and Cross lakes, of 107.4 miles. It also includes the Oswego branch, extending from Three River Point to Oswego, about 25 miles, the Cayuga and Seneca branch, extending from Montezuma aqueduct to Seneca lake at Geneva, 22 miles, and from Seneca lake at Watkins to Montour Falls, 2.75 miles, and the territory covered by the Delta and Hinckley reservoirs in Oneida and Herkimer counties.

The main line of the Erie canal has been divided into four sections, numbered 5, 6 and 7, and the Water-Supply section.

Section No. 5, extending from the east line of Oneida county to Oneida lake at Sylvan Beach, and the Water-Supply residency, including the Delta and Hinckley reservoirs and necessary work connected therewith, have been under the supervision of Senior Assistant Engineer James Burden, with offices at Utica.

Sections Nos. 6 and 7, extending from the head of Oneida lake to the south line of Wayne county, and the Oswego branch, have been under the supervision of Senior Assistant Engineer L. C. Hulburd, with offices in the Weigh Lock building, Syracuse.

Senior Assistant Engineer H. C. Smith, with offices at Seneca Falls, has had charge of the Cayuga and Seneca branch.

The reports of the Senior Assistant Engineers are appended, and will give in detail the progress on both the special and Barge canal work.

During the year, as in the past, this office has coöperated with the Department of Public Works in making surveys and maps, in preparing evidence for the Court of Claims, in the location of buoys in the canalized rivers and lakes, and in making investigations and reports on applications for permits for the use of, or the releasing and abandoning of canal lands.

The appended table, "A," shows the amount of work in dollars that has been done to date on each contract on the Division, also the work done during the year and the percentages of work done to date and during the fiscal year.

Permit me to commend the men on the Division for their faithful and efficient service and to thank you for the assistance and consideration you have given me in carrying on the work of the Division.

Respectfully submitted,

GUY MOULTON,  
*Division Engineer.*

TABLE "A"

## PROGRESS ON CONTRACTS, BARGE CANAL, MIDDLE DIVISION

*Erie and Oswego Canals*

CONTRACT NO.	Contract price as modified by alterations	Total amount of work done to July 1, 1917	Work done during year	Per cent of work done to July 1, 1917	Per cent of work done during year
4.	\$726,780	\$720,073	0	Finished	0.0
4-B.	1,351	1,332	0	Finished	0.0
5.	156,491	125,820	0	Finished	0.0
5-A.	326,902	319,351	0	Finished	0.0
7.	42,990	41,797	0	Finished	0.0
10.	1,187,169	668,360	0	Suspended	0.0
10-A.	174,514	166,172	0	Finished	0.0
10-B.	500,213	526,006	0	Finished	0.0
10-C.	38,615	39,904	0	Finished	0.0
12.	3,499,401	3,102,437	0	Finished	0.0
13.	14,159	13,480	0	Finished	0.0
22.	127,937	116,882	0	Finished	0.0
22-A.	27,099	26,984	0	Finished	0.0
22 Special*		12,447	0	Finished	0.0
33.	30,918	24,961	0	Finished	0.0
35.	723,632	672,349	0	Finished	0.0
37.	2,496,063	2,606,789	0	Finished	0.0
37-R.	4,891	3,659	0	Finished	0.0
39.	1,032,561	953,695	\$37,065	Finished	3.6
42.	1,220,739	478,670	0	Suspended	0.0
42-A.	1,239,045	1,139,680	137,650	91.9	11.1
43.	1,888,080	1,297,780	24,480	92.7	1.8
44.	1,708,598	1,625,205	0	Finished	0.0
44-A.	52,486	36,140	36,140	68.9	68.9
45.	472,802	418,652	0	Finished	0.0
46.	842,721	842,689	0	Finished	0.0
46-A.	196,134	157,750	125,260	80.4	63.9
46-B.	277,348	144,190	137,800	52.0	49.7
50.	998,066	987,699	0	Finished	0.0
51.	414,870	353,780	36,270	85.3	8.7
53.	167,585	164,576	0	Finished	0.0
55.	945,840	882,773	0	Finished	0.0
55-R.	7,561	7,526	0	Finished	0.0
Shelter on No. 55.	2,234	2,234	0	Finished	0.0
57.	93,596	93,315	0	Finished	0.0
78.	49,026	50,068	0	Finished	0.0
79.	37,480	33,980	0	Finished	0.0
80.	117,391	110,886	0	Finished	0.0
81.	54,686	45,680	45,680	83.5	83.5
85.	13,151	12,098	0	Finished	0.0
90.	84,010	82,759	0	Finished	0.0
90-A.	64,020	62,884	0	Finished	0.0
93.	380,757	364,305	0	Finished	0.0
99†	72,993	330	330	0.5	0.5
100.	178,992	162,671	0	Finished	0.0
101.	40,984	39,150	0	Finished	0.0
102.	25,993	24,534	0	Finished	0.0
103.	205,745	182,825	1,815	Finished	0.9
104.	39,370	36,856	0	Finished	0.0
110.	129,566	123,860	0	Finished	0.0
116.	72,145	76,672	0	Finished	0.0
121.	9,670	9,051	0	Finished	0.0
123.	16,574	17,530	0	Finished	0.0
132.	70,330	40,270	40,270	57.3	57.3
139.	25,912	17,130	17,130	66.1	66.1
153.	4,389	0	0	0.0	0.0
157.	6,248	500	500	8.0	8.0
158.	2,398	2,398	2,398	Finished	100.0

\* This was a special agreement made by the Superintendent of Public Works with John Eichleay, Jr., Co., for safeguarding the superstructure of the Weedsport bridge.

† Figures given are for the portion of this contract under chapter 147, Laws of 1903, and amendatory laws. This contract also includes work under chapter 716, Laws of 1915, which appropriated \$50,000. The contractor's bid on this portion was \$42,988, and the value of work done to date is \$16,080.

## PROGRESS ON CONTRACTS, MIDDLE DIVISION — (Continued)

*Erie and Oswego Canals — (Continued)*

CONTRACT NO.	Contract price as modified by alterations	Total amount of work done to July 1, 1917	Work done during year	Per cent of work done to July 1, 1917	Per cent of work done during year
Road A adjacent to No. 37...	\$4,621	\$2,208	0	Finished	0.0
Road B, adjacent to No. 37...	91,531	82,301	0	Finished	0.0
Highways on No. 50.....	62,011	58,634	0	Finished	0.0
Hinckley highways.....	96,079	85,990	0	Finished	0.0
Highways on No. 55.....	46,387	45,315	0	Finished	0.0
Highways on No. 78.....	15,420	16,734	0	Finished	0.0
Ox creek highways.....	73,353	62,578	0	Finished	0.0
Peter Scott highways.....	38,827	40,785	0	Finished	0.0
Hinmansville highways.....	2,505	2,475	0	Finished	0.0
Rome highways.....	32,111	20,131	\$18,237	62.7	56.8
	\$23,304,106	\$20,678,745	\$661,025	.....	.....
Extra work.....	.....	119,313	13,931	.....	.....
Totals.....	.....	\$20,798,058	\$674,956	.....	.....

*Cayuga and Seneca Canal*

A.....	\$376,233	\$350,974	0	Finished	0.0
A-1.....	26,842	24,140	\$24,140	89.9	89.9
B.....	1,388,434	1,303,763	19,063	Finished	1.4
C.....	1,195,407	1,101,720	0	Finished	0.0
D.....	1,059,553	944,064	13,794	Finished	1.3
E.....	353,660	315,980	0	Finished	0.0
F.....	142,579	120,160	58,940	84.3	41.3
G.....	110,115	102,004	4,604	Finished	4.2
H.....	225,001	218,479	0	Finished	0.0
I.....	203,440	186,886	0	Finished	0.0
J.....	47,648	45,122	0	Finished	0.0
K.....	63,214	60,480	0	Finished	0.0
L.....	59,928	53,010	27,774	88.5	46.3
M.....	191,436	165,100	18,770	86.3	9.8
	\$5,443,490	\$4,991,882	\$167,085	.....	.....
Extra work.....	.....	90,079	8,845	.....	.....
Totals.....	.....	\$5,081,961	\$175,930	.....	.....

*Terminals*

1.....	\$46,464	\$40,536	0	Finished	0.0
15.....	577,915	575,807	\$12,037	Finished	2.1
16.....	91,954	86,715	0	Finished	0.0
20.....	566,753	377,880	300,500	66.7	53.0
28.....	37,222	28,790	13,450	77.3	36.1
29.....	39,793	3,400	2,450	8.5	6.2
30.....	106,583	71,700	66,940	67.3	62.8
33.....	351,175	332,940	88,800	94.8	25.3
46.....	13,658	11,457	8,197	83.9	60.0
205.....	13,907	12,830	12,830	92.2	92.2
	\$1,845,424	\$1,542,055	\$505,204	.....	.....
Extra work.....	.....	7,661	7,190	.....	.....
Totals.....	.....	\$1,549,716	\$512,394	.....	.....
Grand totals.....	.....	\$27,429,735	\$1,363,280	.....	.....

## APPENDED REPORTS — MIDDLE DIVISION

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### SPECIAL APPROPRIATIONS

Senior Assistant Engineer Edward J. Berry reports:

*Continuing and Completing the Construction of a Bridge over  
the Black and Moose Rivers at Lyons  
Falls, Lewis County*

(Chapters 699 and 728, Laws of 1915)

Contractor, Walter L. Rae.

Engineer in charge, David R. Lee.

Engineer's estimate .....	\$59,385 00
Contractor's bid .....	54,911 00
Work done to date .....	56,370 00

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A supplementary agreement, approved by the Canal Board May 23, 1917, increased the cost by \$6,630.60, making the contract price, as modified by the agreement, \$61,541.60.

*Construction of a Bridge over the Erie Canal in the Village of  
Yorkville, Oneida County*

(Chapter 745, Law of 1913, and Chapter 584, Laws of 1915)

Contractors, Scott Brothers.

Engineer in charge, Charles Kiehm.

Engineer's estimate .....	\$108,180 00
Contractors' bid .....	94,582 60
Amount of final account.....	134,854 28

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A supplementary agreement, approved by the Canal Board April 27, 1915, increased the cost by \$11,691.50; a supplementary agreement, approved by the Canal Board July 23, 1915, increased the cost by \$40,914.90, and a supplementary agreement, approved by the Canal Board October 11, 1916, increased the cost by \$172.74, making the contract price, as modified by these agreements, \$147,361.74.

*Construction of a New Steel Plate-girder Bridge over the Erie  
Canal at Clinton Street, in the Village of  
Whitesboro, Oneida County*

(Chapter 704, Laws of 1915)

Contractor, M. Fitzgerald.

Engineer in charge, John P. Walsh.

Engineer's estimate .....	\$9,689 50
Contractor's bid .....	9,471 90
Amount of final account.....	8,767 76

A supplementary agreement, approved by the Canal Board December 28, 1916, increased the cost by \$200.00, making the contract price, as modified by the agreement, \$9,671.90.

*Repairing the West Wall of the Canal Feeder on Main Street, in  
the City of Oneida, Madison County*

(Chapter 705, Laws of 1915)

Contractor, C. E. Wells.

Engineer in charge, F. W. Kinney.

Engineer's estimate .....	\$3,527 50
Contractor's bid .....	3,122 50
Amount of final account.....	2,861 30

A supplementary agreement, approved by the Canal Board September 21, 1916, increased the cost by \$147.58, making the contract price, as modified by the agreement, \$3,570.08.

*Constructing a Bascule Bridge over the Erie Canal at West  
Genesee Street, Syracuse, Onondaga County*

(Chapter 715, Laws of 1913)

Contractors, Lupfer & Remick.

Engineer in charge, Eugene C. Olcott.

Engineer's estimate .....	\$46,485 50
Contractors' bid .....	40,472 50
Amount of final account.....	42,839 93

A supplementary agreement, approved by the Canal Board May 23, 1917, increased the cost by \$3,345.82, making the contract price, as modified by the agreement, \$43,818.32.

*Repairing the West Pier at the Foot of Owasco Lake and  
Dredging the Owasco Outlet*

(Chapter 654, Laws of 1913)

Contractors, S. V. R. Malcolm & Son. Assigned to Z. T. Darrow & Son.

Engineer in charge, M. J. Chryst.

Engineer's estimate .....	\$19,595 95
Contractors' bid .....	17,652 50
Work done to date.....	11,980 00

Contract cancelled by the Superintendent of Public Works.

During the year the following surveys were made and maps and reports prepared to accompany them:

Proposed new bridge over Limestone creek in the village of Orville.

Proposed improvement to Limestone creek in the village of Fayetteville.

An engineering party has been in the field since March 19, 1917, making a survey of lands lying adjacent to Onondaga lake, the elevations of which are below 366.5. This survey is made for the purpose of gathering data for the Attorney-General to aid him in the defense of claims arising from damages alleged to have been due to the raising of the State dam at Phoenix. This survey is not yet completed.

#### LAND ABANDONMENTS AND SURVEYS

Many surveys have been made and maps prepared of unused canal lands, sought to be abandoned according to the procedure prescribed by the Canal Board.

#### COURT OF CLAIMS

In addition to the work usually required by the Superintendent of Public Works in connection with ordinary repairs, a large



amount of survey work and mapping has been made of property alleged to have been damaged by the State, also reports made and data properly arranged for the Court of Claims and the Attorney-General. A large amount of time is spent by the engineers as witnesses for the State on local claims during the sessions of the Court.

### BLUE LINE SURVEY

(Chapter 646, Laws 1916)

This law provides for surveys, field notes and manuscript maps affecting various canals and canal lands.

The work on the Middle Division was assigned to Assistant Engineers R. K. Sheldon and B. I. Hall. The following work has been done during the fiscal year ended June 30, 1917:

#### *Erie Canal*

During the fiscal year the "red line" has been established from Nine-Mile creek aqueduct westward to the Wayne county line, a distance of about 29 miles.

"Blue line" points are monumented with iron rods,  $\frac{3}{4}$  inch in diameter and 3 feet long, from Centerport bridge to the Seneca river aqueduct, except those points covering the appropriations made during the Nine-Million Improvement.

Reinforced concrete monuments,  $4\frac{1}{2}$  feet long by 8 inches in diameter, with metal tablet imbedded in the top, showing station, offset distance and angle point, have been set to establish the "red line" from the Syracuse east city line to the village of Warners, a distance of 13 miles, and from Centerport bridge to the Wayne county line, a distance of 11.3 miles.

A base line has been run and topography taken from the Syracuse east city line to a point one mile west of Canaseraga, a distance of 15 miles.

Blue line maps from Centerport to the Wayne county line have been platted, but not traced.

Tracings on standard size sheets from the Syracuse east city line to the village of Warners are 90 per cent completed.

*Feeders — Erie Canal*

*Carpenter Brook Feeder.* Work is completed except monumenting.

*Owasco Feeder.* Base line completed and topography taken.

*Camillus Feeder.* Work finished except one-half mile of red line to be established and tracings to be made.

*Oswego Canal*

The blue line has been completed through the cities of Fulton and Oswego.

A considerable amount of work has been done between Fulton and Oswego in connection with Barge canal contracts, also between Phoenix and Fulton.

About 1½ miles of blue line have been completed near Belgium.

Base line has been run, topography taken and platted to 40-ft. scale for study from Morseman's lock to Mud lock. Base line has been run, topography taken and platted to 40-ft. scale for study from Three River Point to Baldwinsville.

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**ERIE CANAL, RESIDENCY No. 5**

Senior Assistant Engineer James Burden reports:

Residency No. 5 extends from the east line of Oneida county to the west line of Oneida county, a distance of about 38 miles, and includes also the water-supply contracts in the northern part of Oneida county.

*Contract No. 42-A*

This contract is for completing the construction of the canal, together with all incidental work, between the Herkimer-Oneida county line and a point just east of Oriskany road, Sta. 5775. Length, 8.96 miles. It was awarded to Grant Smith & Company & Locher of Rome, N. Y., being signed on February 24, 1913. Work was begun March 13, 1914. The engineer's preliminary estimate was \$1,033,037.85, the contractor's bid, \$1,014,671.83.

The contract price as modified by alterations Nos. 1 and 2 is \$1,239,045.03.

Robert E. Swinney, Assistant Engineer, is in charge.

The contract was modified by alteration No. 1, approved by the Canal Board April 28, 1914, the objects of which were to flatten the side slopes of the prism, to provide wooden sheet-piling in the embankment, to substitute concrete walks for gravel walks on the Genesee street highway bridge approaches, and to provide catch-basins and drains at the north approach to Genesee street highway bridge. This alteration added \$56,410.20 to the contract price. The only item in this alteration that remained uncompleted on July 1, 1916, was excavation, and this has since been completed.

It was further modified by alteration No. 2, approved by the Canal Board July 28, 1915, the objects of which were to provide for protecting the bank of the canal and riprapping the slopes of the creek in the vicinity of the stream entrance at Sta. 5639 + 90; to provide for replacing the present wooden pavement with a yellow pine plank floor at the Whitesboro-Marcy road, Carey road and Schuyler street bridges; to provide for placing wash wall on the bank of the canal at various points. This alteration added \$167,963.00 to the contract price. The first and second of these items were completed during the year and about 60 per cent of the wash wall was placed, making the alteration about 75 per cent completed.

During the year the prism excavation and the embankments were practically completed and about six miles of wash wall were placed. There have been unusual floods and much gravel was washed into the prism at various stream entrances. This has been removed.

The excavation on this contract was done with two 20-inch suction dredges. Three drag line machines were used in trimming embankments and placing wash wall.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....acres	4	0.69	3.57	17.2	89.2
Grubbing.....cu. yds.	34,000	0	18,078	0.0	53.2
Excavation.....cu. yds.	1,058,100	117,202	1,007,295	11.1	95.2
Sheeting and bracing.....ft. B. M.	218,000	0	163,184	0.0	75.5
Forming embankment.....cu. yds.	329,000	6,111	291,472	1.9	88.6
Lining.....cu. yds.	3,423	63	2,640	1.8	77.1
Puddle.....cu. yds.	390	0	386.3	0.0	99.1
Sawed lumber, yellow pine or Douglas fir.....ft. B. M.	16,300	0	15,237	0.0	93.5
Sawed lumber in needles, yellow pine.....ft. B. M.	11,000	0	10,476	0.0	95.2
Crescoted lumber.....ft. B. M.	77,000	0	75,427	0.0	98.0
White oak.....ft. B. M.	7,800	0	8,500	0.0	109.0
Foundation piles, 12 to 30 feet long lin. ft.	134,000	0	127,315	0.0	95.0
Mooring piles, 20 feet long.....lin. ft.	400	360	360	90.0	90.0
Wooden sheet-piling.....ft. B. M.	680,000	3,264	638,767	0.5	93.9
Second-class concrete.....cu. yds.	31,602	180	30,295.3	0.5	95.9
Reinforced concrete.....cu. yds.	2,020	0.6	1,826.4	0.0	90.4
Finishing concrete surfaces.....sq. ft.	1,000	0	859	0.0	85.9
First-class masonry bridge coping.....cu. yds.	9	0	8.5	0.0	94.4
Wash wall.....cu. yds.	54,260	30,670	39,320	56.5	72.4
Second-class stone paving.....sq. yds.	2,730	507.4	543.7	18.6	19.9
Second-class riprap.....cu. yds.	1,810	144	1,613	8.0	89.8
Structural steel.....lbs.	707,850	0	695,044	0.0	98.2
Metal reinforcement.....lbs.	232,000	144	230,322	0.1	99.3
Wrought iron.....lbs.	2,260	0	0	0.0	0.0
Steel castings.....lbs.	*15,700	9,205	15,057	52.3	95.9
Iron castings, machined.....lbs.	8,500	0	8,232	0.0	96.8
Portland cement sidewalks.....sq. ft.	6,214	0	5,162.6	0.0	83.1
Curbing.....lin. ft.	930	0	762.2	0.0	82.0
Cobblestone gutters.....lin. ft.	380	0	358	0.0	94.2
Macadam pavement.....sq. yds.	1,870	0	1,494.8	0.0	80.0
Wood-block pavement.....sq. yds.	1,375	0	1,337	0.0	97.2
Wooden fence.....lin. ft.	4,180	0	3,671	0.0	87.8
Wrought-iron pipe railing.....lin. ft.	760	0	603	0.0	79.3
Lattice railing.....lin. ft.	444	0	444	0.0	100.0
Metal in lock-gates.....lbs.	220,000	0	206,800	0.0	94.0
Metal in buffer-beams.....lbs.	85,000	7,300	80,460	8.6	94.7
Metal in lock-valves.....lbs.	34,000	0	32,660	0.0	96.1
Maintaining highway traffic.....lump sum	\$2,000	\$100	\$1,740	5.0	87.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$10,000	\$500	\$9,900	5.0	99.0
Cleaning up site of contract, removing plant and debris.....lump sum	\$4,000	\$600	\$3,600	15.0	90.0
Deduct for buildings.....lump sum	\$250	\$25	\$250	10.0	100.0
<i>Additional items not included in contract No. 48</i>					
Wooden sheet-piling.....ft. B. M.	2,322,000	71,400	2,254,482	3.1	97.1
Second-class concrete.....cu. yds.	1,105	0	1,104.3	0.0	99.9
Grubbing.....cu. yds.	630	0	450	0.0	71.4
Excavation.....cu. yds.	47,416	8,307	53,292	17.5	112.4
Embankment.....cu. yds.	14,840	444	9,592	3.0	64.7
Standard field office building.....lump sum	\$250	0	\$250	0.0	100.0
<i>New items added by alterations</i>					
Brick masonry.....cu. yds.	3.8	0	3.4	0.0	89.5
12-inch vitrified pipe, laid.....lin. ft.	270	0	260	0.0	96.3
Catch-basin covers.....No.	2	0	2	0.0	100.0
Removing bridge pavements.....No.	3	0	3	0.0	100.0
Gross estimate at contract prices.....	\$1,239,265 03	\$137,650 17	\$1,139,688 78	11.1	91.9

\* Figures given include an excess quantity authorised by the Canal Board, as follows:  
Steel castings, 4,400 lbs., by resolution dated Aug. 24, 1916.

This quantity at the contract price amounts to \$220.00.

*Contract No. 43*

This contract is for constructing the canal from a point just east of Oriskany road to about 1,500 feet west of Mud creek. Length, 10.32 miles. It was awarded to The M. A. Talbott Company, Inc., of Baltimore, Maryland, being signed on October 15, 1909. Work was begun about the first of September, 1910. The engineer's preliminary estimate was \$1,529,885.00, the contractor's bid, \$1,320,560.00. The contract price as modified by the several alterations is \$1,388,080.05.

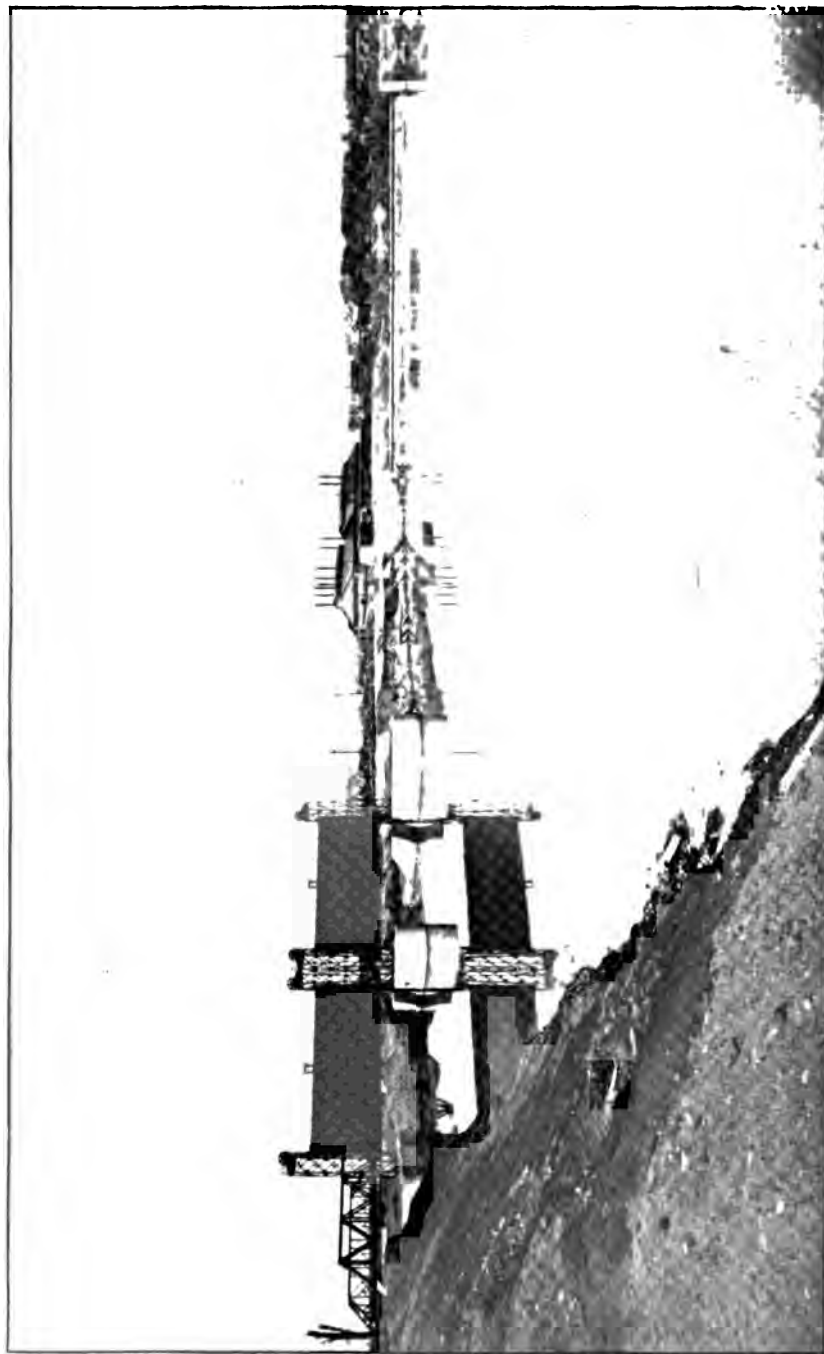
Henry J. O'Neill and D. J. Levinson, Assistant Engineers, have been in charge during the year.

The contract has been modified by alterations Nos. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16. The construction under all of these alterations except Nos. 13 and 16 was completed previous to July 1, 1916.

Alteration No. 13, approved by the Canal Board March 23, 1914, provided for substituting third-class concrete blocks for third-class riprap at the east and west guard-gates. This alteration made no change in the contract price. The work under this alteration was completed during the year.

Alteration No. 16, approved by the Canal Board July 21, 1915, provided for flattening the side slopes of the prism to a 1 on 3 slope from a point three feet below pool level on the south side of the canal from about Sta. 6131 to the guard-gate at about Sta. 6171, and for eliminating wash wall on both sides of the prism within these limits; for substituting second-class concrete for riprap at stream entrances and spillways where directed by the engineer; for concrete copings on bridge abutments; for changing the location of the dikes at the Nine-Mile creek entrance and for placing a protection of third-class riprap on a portion of these dikes; and for substituting wash wall for riprap below the Mohawk river retention dam. This alteration deducted \$10,479.50 from the contract price. This work was completed during the year.

Extra work order dated March 29, 1916, provided for the construction of a ditch to drain land cut off by Barge canal construction. The work consisted of 2,947 cu. yds. of excavation and



BARGE CANAL, CONTRACT NO. 43

The place where the Rome summit level receives through the Mohawk river its water-supply from Delta and other Adirondack reservoirs. About three miles to the east the surplus waters of the river are spilled. A guard-gate at each end of this stretch protects the channel from floods. The western guard-gate is here shown.

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the payment to the contractor, approved by resolution of the Canal Board adopted March 22, 1917, was \$1,473.50.

Extra work order dated July 20, 1916, provided for a wooden bridge over the above ditch. The payment to the contractor, approved by resolution of the Canal Board adopted March 14, 1917, was \$76.34.

Extra work order dated October 25, 1916, provided for repairs to the concrete paving below Nine-Mile creek spillway, which had become displaced in several places, and for placing additional riprap along the banks below the spillway, where erosion had taken place. When these repairs were undertaken it was found that a much larger amount of work was necessary than had been expected, as the supporting earth had been entirely washed away below the slabs of concrete adjacent to the spillway. These slabs were removed and the space below was filled with material carefully puddled. Before relaying the slabs a shelf was cut in the side of the spillway. Holes were drilled into the spillway, into which steel rods were inserted, which also ran into the new concrete slabs, thus tying them to the spillway. The concrete removed was used as additional bank protection. This work is not yet quite completed. The cost of that already done is about \$8,000.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....acres	140	0	127	0.0	90.7
Excavation.....cu. yds.	5,575,755	60,734	5,124,854	1.1	91.9
Sheeting and bracing.....ft. B. M.	311,600	0	299,884	0.0	96.2
Forming embankment.....cu. yds.	237,050	0	216,889	0.0	91.5
Lining.....cu. yds.	4,640	409	4,500	8.8	97.0
Puddle.....cu. yds.	130	0	136	0.0	104.6
Sawed lumber, yellow pine or Douglas fir.....ft. B. M.	14,630	0	13,933	0.0	95.6
Sawed lumber, hemlock.....ft. B. M.	8,250	2,856	6,726	34.6	81.5
White oak lumber.....ft. B. M.	3,700	0	3,187	0.0	86.1
Foundation piles, 12 ft. to 30 ft. long.....lin. ft.	69,324	0	75,132	0.0	108.4
Mooring piles, 20 ft. long.....lin. ft.	420	0	320	0.0	76.2
Wooden sheet-piling.....ft. B. M.	418,600	0	417,638	0.0	99.8
Second-class concrete.....cu. yds.	23,096	0	21,976	0.0	95.2
Reinforced concrete.....cu. yds.	654	0	630	0.0	96.4
First-class masonry coping.....cu. yds.	3	0	2.0	0.0	96.7
Wash wall.....cu. yds.	7,460	3,474	3,484	46.6	46.7
First-class stone paving.....sq. yds.	5,700	50	5,284	0.9	92.7
Second-class stone paving.....sq. yds.	5,755	1,833	3,662	31.9	63.6
Third-class riprap.....cu. yds.	4,704	1,637	4,263	34.8	90.7



ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Structural steel.....lbs.	589,400	0	582,675	0.0	95.5
Metal reinforcement.....lbs.	55,600	0	53,169	0.0	95.6
Wrought iron.....lbs.	2,700	0	1,809	0.0	67.0
Steel castings.....lbs.	4,000	0	3,690	0.0	92.2
Iron castings, plain.....lbs.	4,700	0	3,781	0.0	80.5
Iron castings, machined.....lbs.	5,700	0	6,050	0.0	106.1
Wooden pavement.....sq. yds.	540	0	508	0.0	94.1
Wooden fence.....lin. ft.	2,980	0	3,195	0.0	107.2
Metal in sluice-gates.....lbs.	46,500	0	44,296	0.0	95.3
Metal in guard-gates.....lbs.	780,000	0	769,655	0.0	97.4
Maintaining highway traffic.....lump sum	\$8,000	0	\$8,000	0.0	100.0
Maintaining navigation.....lump sum	\$100	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining, lump sum	\$12,000	0	\$11,040	0.0	92.0
Deduct for removing old bridge.....lump sum	\$50	0	0	0.0	0.0
Deduct for removing buildings.....lump sum	\$7,000	0	0	0.0	0.0
Paved gutters.....sq. yds.	150	0	142	0.0	94.7
Stone curbs.....lin. ft.	680	0	645	0.0	94.9
Crescoted lumber.....ft. B. M.	22,600	0	21,040	0.0	93.1
Wood-block pavement.....sq. yds.	488	0	467	0.0	95.7
Lattice railing.....lin. ft.	192	0	187	0.0	97.4
Additional coffer-dams, pumping, bailing and draining, alteration No. 3.....lump sum	\$300	0	\$300	0.0	100.0
Additional coffer-dams, pumping, bailing and draining, alteration No. 9.....lump sum	\$1,400	0	\$1,400	0.0	100.0
Steel sheet-piling.....sq. ft.	14,000	0	14,000	0.0	100.0
Driving steel sheet-piling.....sq. ft.	29,000	0	23,434	0.0	80.8
Third-class concrete blocks.....cu. yds.	210	98	190	46.7	90.5
Second-quality steel sheet-piling, delivered and driven.....sq. ft.	5,000	0	5,036	0.0	100.7
Deduct for sheeting and bracing, reus'd, ft. B. M.	.....	0	45,234	.....	.....
Gross estimate at contract prices.....	\$1,388,080 05	\$24,478 61	\$1,287,784 68	1.8	92.7
<i>Extra Work Orders</i>					
Feb. 27, 1913.....contract unit prices	\$7,751 00	.....	\$4,914 60	.....	Finished
June 27, 1914, cost plus 15 per cent and contract and special unit prices	.....	.....	5,427 84	.....	Finished
April 24, 1915.....contract unit prices	1,661 30	.....	1,946 69	.....	Finished
May 10, 1915.....contract unit prices	1,544 00	.....	1,476 68	.....	Finished
Mar. 29, 1916.....special unit price	1,750 00	.....	1,473 50	.....	Finished
July 20, 1916.....contract unit price	77 00	.....	76 34	.....	Finished
Oct. 25, 1916, cost plus 15 per cent and contract unit price	.....	.....	.....	.....	.....
Total.....	.....	.....	\$15,315 65	.....	.....

## Contract No. 81

This contract is for constructing a junction lock at Rome. It was awarded to Chesley, Earl & Heimbach, Inc., of Buffalo, N. Y., being signed on October 17, 1916. Work was begun November 4, 1916. The engineer's preliminary estimate was \$61,236.40, the contractor's bid, \$53,998.90. The contract price as modified by alteration No. 1 is \$54,685.90.

Lewis Bartlett, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board March 1, 1917, provided for eliminating wooden sheet-piling under the junction lock and for substituting steel sheet-piling along the outside edge

of the lock masonry for the wooden sheeting originally provided for the lock excavation, it having been found impossible to drive wooden sheet-piling. This alteration added \$687.00 to the contract price.

Extra work order dated December 11, 1916, provided for constructing a field office for the engineers at the site of the contract. This was paid for in the lump sum of \$55.00.

Extra work order dated February 23, 1917, provided for furnishing labor and materials necessary to construct patterns for hand wheels, main supports, bearings and cup wheels, also for shipping them to the Division Superintendent of Public Works. This work has not been completed.

Extra work order dated March 22, 1917, provided for transporting steel sheet-piling from the site of contract No. 44 to the junction lock at Rome, driving it for sheeting, and returning it when no longer required. The engineer's preliminary estimate was \$2,000.00. Work has so far been executed and paid for under this extra work order to the amount of \$1,085.00.

The concrete lock walls have been completed and the construction of the lock-gates is under way. The contract is nearing completion.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Excavation..... cu. yds.	15,800	9,111	57.7
Sawed lumber, yellow pine or Douglas fir..... ft. B. M.	11,000	6,200	56.4
Forming embankment..... cu. yds.	3,100	856	27.6
Sheeting and bracing..... ft. B. M.	25,000	22,800	91.2
Foundation piles..... lin. ft.	20,000	16,985	84.9
Second-class concrete..... cu. yds.	3,980	3,734	94.5
Wash wall..... cu. yds.	150	0	0.0
Structural steel..... lbs.	3,820	0	0.0
Iron castings, plain..... lbs.	5,680	2,826	49.8
Iron castings, machined..... lbs.	6,400	2,766	43.2
Tumble-gate machinery..... lbs.	6,100	2,266	37.1
Chipping concrete..... cu. ft.	150	0	0.0
Drilling bolt-holes in concrete..... lin. ft.	30	0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$3,600	\$3,564	99.0
Steel sheet-piling..... sq. ft.	14,000	11,571	83.7
Cutting steel sheet-piles..... No. of cuts	160	99	61.9
Gross estimate at contract price.....	\$54,685 90	\$45,686 86	83.5
<i>Extra Work Orders</i>			
Dec. 11, 1916..... lump sum	\$55 00	\$55 00	Finished
Feb. 23, 1917..... lump sum	68 71		
Mar. 22, 1917..... special unit price	2,000 00	1,085 00	
Total.....	\$2,123 71	\$1,140 00	

*Contract No. 157*

This contract is for constructing a dam across the old Erie canal at Rome. It was awarded to Thomas Bowen of Rome, N. Y., being signed on April 20, 1917. Work was begun April 24, 1917. The engineer's preliminary estimate was \$4,924.00, the contractor's bid, \$5,912.00. The contract price as modified by alteration No. 1 is \$6,247.50.

D. J. Levinson, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board April 25, 1917, changed the location of the dam and increased the length of the tow-path wing wall. This alteration added \$335.50 to the contract price.

This dam is being built across the old Erie canal to act as a spillway and maintain the level above the north junction lock.

The excavation for the structure has practically been completed and the driving of foundation piles is under way.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	540	313	58.0
Forming embankment.....cu. yds.	240	0	0.0
Wooden sheet-piling.....ft. B. M.	30,000	1,992	6.6
Lining.....cu. yds.	20	0	0.0
Second-class concrete.....cu. yds.	281	0	0.0
Foundation piles.....lin. ft.	2,160	510	23.6
Coffer-dams, pumping, bailing and draining.....lump sum	\$500	0	0.0
Gross estimate at contract prices.....	\$6,247 50	\$505 74	8.1

*Contract No. 44-A*

The contract is for completing the construction of the canal prism near the junction lock at New London. Length, 0.6 mile. It was awarded to Scott Brothers of Rome, N. Y., being signed on October 10, 1916. The work was begun about November 1, 1916. The engineer's preliminary estimate was \$57,050.00, the contractor's bid, \$52,486.00.

Foster B. Crocker, Assistant Engineer, is in charge.

This work covered a short stretch of the canal which had to be eliminated from contract No. 44 in order to keep navigation open during the season of 1916.

The excavation was begun with the hydraulic dredge *Stanwix*. The material was found to be so hard that it was necessary to drill and blast it before it could be removed with the dredge. The material was placed in the bed of the old Erie canal to the east. The material for three or four feet above the bottom contained many boulders, which it was impossible to excavate with the suction dredge, and so a dipper-dredge and scows were used, the material being removed from the scows with a drag-line excavator.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	114,100	78,563	68.9
Gross estimate at contract prices.....	\$52,486 00	\$36,148 18	68.9

#### *Contract No. 132*

This contract is for constructing lighthouses, range towers, beacons, etc., and for furnishing and installing buoys and lighting equipments for aids to navigation on Oneida and Onondaga lakes. It was awarded to Lupfer & Remick of Buffalo, N. Y., being signed on November 3, 1916. The engineer's preliminary estimate was \$63,937.00, the contractor's bid, \$70,330.20.

W. J. Durkan, Assistant Engineer, is in charge.

For details of work done on this contract see report of Residency No. 6, Erie canal.

#### *Contract No. 51*

This contract is for constructing a canal feeder between Trenton Falls and Nine-Mile creek, together with a gate-house, culverts and all other work appertaining to the contract. Length,

5.75 miles. It was awarded to George T. Cunningham of Utica, N. Y., being signed on December 23, 1910. On August 8, 1911, it was assigned to the Alto Construction Company of Utica. Work was begun February 27, 1911. The engineer's preliminary estimate was \$424,710.00, the contractor's bid, \$389,842.50. The contract price as modified by alterations Nos. 1, 2, 3, 4, 5, 6 and 7 is \$414,869.85.

John L. Bush and George H. Briggs, Assistant Engineers, have been in charge during the year.

The construction under alterations Nos. 1, 2 and 4 was completed previous to July 1, 1916.

Alteration No. 3, approved by the Canal Board August 27, 1912, provided for the diversion of Cincinnatus creek and for reinforcing the bank of the feeder. This alteration added \$4,696.80 to the contract price. The work has been completed.

Alteration No. 5, approved by the Canal Board September 29, 1915, provided for eliminating construction of farm bridge at about Sta. 173; for building retaining wall along prism below gate-house; for eliminating sluiceway at about Sta. 26; for placing sluice-gate in head-wall of siphon; for placing cast-iron drain pipe through bank at about Sta. 26 and for widening roadways at culverts. This alteration added \$2,642.52 to the contract price. This work has been completed.

Alteration No. 6, approved by the Canal Board September 27, 1916, provided for placing third-class riprap on the banks of the feeder prism between approximately Sta. 211+92 and Sta. 219+80. This alteration added \$4,000.00 to the contract price. This work has been completed.

Alteration No. 7, approved by the Canal Board March 1, 1917, provides for placing third-class riprap on the banks of the feeder prism in the vicinity of the highway crossing near Sta. 200. This alteration added \$8,000.00 to the contract price. This work is nearing completion.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....lump sum	\$200	\$28	\$200	14.0	100.0
Excavation.....cu. yds.	540,020	44,098	576,104	8.2	106.7
Sheeting and bracing.....ft. B. M.	112,000	0	14,621	0.0	13.1
Round-timber bracing.....lin. ft.	3,000	0	0	0.0	0.0
Forming embankment.....cu. yds.	105,960	891	82,638	0.8	78.0
Lining.....cu. yds.	860	0	314	0.0	36.5
Puddle.....cu. yds.	100	0	86.5	0.0	86.5
Sawed lumber.....ft. B. M.	2,000	0	1,472	0.0	73.6
Foundation piles.....lin. ft.	6,500	0	240	0.0	3.2
Wooden sheet-piling.....ft. B. M.	20,000	0	3,665	0.0	18.3
Steel sheet-piling.....sq. ft.	1,000	0	0	0.0	0.0
Second-class concrete.....cu. yds.	3,674	386.9	4,000	10.0	103.2
Reinforced concrete.....cu. yds.	945	79.6	980	8.4	103.7
Second-class concrete lining.....cu. yds.	4,750	0	0	0.0	0.0
Dry retaining wall.....cu. yds.	905	0	0	0.0	0.0
Wash wall.....cu. yds.	5,000	0	0	0.0	0.0
Second-class stone paving.....sq. yds.	421	0	255	0.0	60.6
Third-class stone paving.....sq. yds.	260	0	217	0.0	83.5
Cobblestone paving.....sq. yds.	1,970	29	545	1.5	27.7
First-class riprap.....cu. yds.	40	0	0	0.0	0.0
Second-class riprap.....cu. yds.	1,140	0	148	0.0	13.0
Third-class riprap.....cu. yds.	8,105	3,372	3,944	41.6	48.7
Fourth-class riprap.....cu. yds.	2,100	41	180	1.9	8.6
Rock-spoil protection.....cu. yds.	10,580	4,671	4,671	44.2	44.2
Cast-iron pipe and specials.....lbs.	56,400	0	57,061	0.0	101.2
12-in. vitrified pipe and specials.....lin. ft.	40	0	37	0.0	92.5
6-in. vitrified pipe and specials.....lin. ft.	7,900	0	0	0.0	0.0
Structural steel.....lbs.	9,700	0	6,680	0.0	68.9
Metal reinforcement.....lbs.	35,670	3,405	33,361	9.6	93.8
Iron castings, plain.....lbs.	1,800	0	0	0.0	0.0
Iron castings, machined.....lbs.	8,800	0	8,602	0.0	100.0
Wooden fence.....lin. ft.	9,840	64	1,472	0.7	15.0
Wrought-iron pipe railing.....lin. ft.	330	0	280	0.0	84.8
Drilling bolt-holes in rock.....lin. ft.	380	0	213	0.0	56.0
Doors, windows and roofing for gate-house, lump sum	\$600	0	\$600	0.0	100.0
Gates and gate-boats.....lump sum	\$2,000	0	\$3,000	0.0	100.0
Tramway in gate-house.....lump sum	\$300	0	\$300	0.0	100.0
Coffer-dams, pumping, bailing and draining, lump sum	\$7,000	\$840	\$6,330	12.0	99.0
Maintaining highway traffic.....lump sum	\$500	\$45	\$455	9.0	91.0
Removing buildings.....No.	6	0	1	0.0	16.7
Office building.....No.	1	0	1	0.0	100.0
Sluice-gate, 24 in. x 36 in.....No.	1	0	1	0.0	100.0
Pipe-drain, 4-in.....lump sum	\$150	\$15	\$150	10.0	100.0
Installing sluice at siphon.....lump sum	\$160	0	\$160	0.0	100.0
Gross estimate at contract prices.....	\$414,899 85	\$36,269 50	\$353,789 39	8.7	85.3
<i>Extra Work Orders</i>					
Aug. 9, 1912.....cost plus 15 per cent	\$816 00		\$816 00		Finished
Nov. 12, 1912.....contract unit price	180 00		126 00		Finished
Sept. 11, 1913.....contract unit prices and lump sums	10,125 60		11,075 43		Finished
Total.....	\$11,121 60		\$12,017 43		

*Construction Work — Barge Canal*

The Barge canal work done on section 5 of the Erie canal is summarized by years and contracts in the following tables:

## ERIE CANAL, MAIN LINE

YEAR*	VALUE OF WORK DONE						
	Contract No. 4	Contract No. 4-B	Contract No. 7 (section 5)	Contract No. 42	Contract No. 42-A	Contract No. 43	Contract No. 44
1906.....	\$41,180						
1907.....	123,900						
1908.....	235,200		\$18,250				
1909.....	242,610		13,670	\$17,790			
1910.....	44,490			211,690			\$109,780
1911.....	32,693	\$1,310		211,790		\$86,960	477,310
1912.....		22		37,400		214,380	335,200
1913.....					\$200,490	295,860	235,720
1914.....					457,830	457,400	314,390
1915.....					193,570	181,270	145,700
1916.....					150,150	27,430	7,135
1917.....					137,650	24,480	
Totals.....	\$720,073	\$1,332	\$31,920	\$478,670	\$1,139,680	\$1,287,780	\$1,625,205

Extra Work Orders Paid, 1906-1917, Inclusive							
1907.....	\$1,257						
1910.....	8,379		\$3,143				
1911.....	2,948						
1913.....						\$4,915	\$344
1914.....						5,427	879
1915.....						1,947	2,630
1916.....						1,477	441
1917.....						1,550	
Totals.....	\$12,584		\$3,143			\$15,316	\$4,794

YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 44-A	Contract No. 81	Contract No. 93 (section 5)	Contract No. 110	Contract No. 132 (section 5)	Contract No. 157	
1906.....							\$41,180
1907.....							123,900
1908.....							253,450
1909.....							274,070
1910.....							265,940
1911.....							810,063
1912.....							587,002
1913.....							732,060
1914.....			\$26,450	\$49,610			1,305,670
1915.....			133,980	72,680			727,200
1916.....			1,210	1,570			187,495
1917.....	\$36,140	\$45,680			\$3,800	\$500	248,250
Totals.....	\$36,140	\$45,680	\$161,640	\$123,860	\$3,800	\$500	\$5,656,280

Extra Work Orders Paid, 1906-1917, Inclusive						
1907.....						\$1,257
1910.....						11,522
1911.....						2,948
1913.....						5,739
1914.....						6,306
1915.....						4,577
1916.....				\$379		2,297
1917.....		\$1,140				2,690
Totals.....		\$1,140		\$379		\$37,356

\* The years 1906 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on the above contracts during 1906, 1908, 1909 and 1912.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 7, sections 1, 7 and 9, Erie canal, and section 2, Champlain; contract No. 93, section 6 and 7, Erie, and section 1, Oswego; contract No. 132, section 6, Erie.

## WATER-SUPPLY

YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 50	Contract No. 51	Contract No. 55	Contract No. 55, Shelter	Contract No. 55-R	Contract No. 123	
1909.....			\$201,610				\$201,610
1910.....			377,800				377,800
1911.....	\$76,220	\$56,650	236,390				369,260
1912.....	157,670	92,980	66,973		\$7,526		325,149
1913.....	296,690	82,060		\$2,234			380,984
1914.....	384,540	12,450				\$12,440	409,430
1915.....	72,579	51,160				5,090	128,829
1916.....		22,210					22,210
1917.....		36,270					36,270
Totals....	\$987,699	\$353,780	\$882,773	\$2,234	\$7,526	\$17,530	\$2,251,542

Extra Work Orders Paid, 1909-1917, Inclusive							
1911.....			\$405				\$405
1912.....		\$816	1,258		\$101		2,175
1913.....	\$1,270	126	375				1,771
1914.....	381	11,075					11,456
1915.....	5,348						5,348
1916.....	975						975
Totals....	\$7,974	\$12,017	\$2,038		\$101		\$22,130

\* The years 1909 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on the above contracts during 1909, 1910 and 1917.

*Terminal Contract No. 15 — Utica*

This contract is for constructing a harbor, dockwall, connecting channel, lock and dam adjacent to the Barge canal at Utica. It was awarded to Albert M. Banker of Gloversville, N. Y., being signed on January 8, 1913, and on September 14, 1914, it was assigned to the Eastover Construction Company, of Utica. Work was begun April 1, 1913. The engineer's preliminary estimate was \$608,071.00. The contractor's bid, \$557,104.50. The contract price as modified by alterations Nos. 1, 2, and 3 was \$577,915.00.

This contract was accepted by the Canal Board September 21, 1916, and the final account of \$575,806.98 was approved February 1, 1917.

Lewis Bartlett and Robert E. Swinney, Assistant Engineers, have been in charge.

The construction under alterations Nos. 1, 2 and 3 was completed previous to July 1, 1916.

Extra work order dated June 15, 1916, provided for bank protection at the retention dam and at the terminal lock at Utica. The engineer's preliminary estimate was \$6,859.80. Work has



so far been done under this extra work order to the amount of \$5,050.00.

Extra work order dated February 28, 1916, provided for removing the existing key plates on the balance beam posts at the dam and replacing them with key plates and fillers securely bolted to the posts. This work was done on a cost plus 15 per cent basis and payment was \$145.19.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation..... cu. yds.	632,900	20,846	584,301	3.3	92.3
Forming embankment..... cu. yds.	20,500	1,283	29,915	4.3	101.4
Lining..... cu. yds.	3,750	2,149	2,816	57.3	75.1
Sheeting and bracing..... ft. B. M.	50,000	61	1,361	0.0	2.7
Sheeting and bracing, reused..... ft. B. M.	25,000	0	0	0.0	0.0
Sawn lumber, yellow pine or Douglas fir..... ft. B. M.	210,000	1,565	301,765	0.7	96.1
White oak lumber in gate-posts and sills..... ft. B. M.	5,000	22	5,022	0.4	100.4
Foundation piles..... lin. ft.	*176,600	66	176,092	0.0	99.1
Wooden sheet-piling..... ft. B. M.	*733,000	2,342	605,042	0.3	82.5
Second-class concrete..... cu. yds.	19,300	2	19,128	0.0	99.1
First-class reinforced concrete..... cu. yds.	20	0	3.1	0.0	15.5
First-class riprap..... cu. yds.	410	0	377.8	0.0	92.1
Second-class riprap..... cu. yds.	19,200	0	928.8	0.0	48.4
Fourth-class riprap..... cu. yds.	3,600	6.1	3696.1	0.2	102.7
Cast-iron pipe, laid..... lbs.	74,000	0	26,707	0.0	36.1
Pipe valve..... No.	1	0	0	0.0	0.0
Structural steel..... lbs.	*28,600	0	19,087	0.0	66.7
Metal reinforcement..... lbs.	12,800	101	11,840	0.8	92.5
Malleable cast-iron nosing..... lin. ft.	1,880	15	1,775	0.8	94.4
Metal wall protection..... lin. ft.	240	1	265	0.4	110.4
Iron castings, plain..... lbs.	13,800	0	13,688	0.0	98.5
Iron castings, machined..... lbs.	7,000	0	6,274	0.0	89.6
Metal in Tainter gates..... lbs.	180,700	448	173,902	0.2	96.2
Metal in lock-valves..... lbs.	23,400	322	22,057	1.4	94.3
Metal in buffer-beams..... lbs.	97,000	923	92,213	1.0	95.1
Metal in miter-gates..... lbs.	102,000	554	97,484	0.5	95.6
Metal in lift-gate and towers..... lbs.	175,600	2,210	176,707	1.3	100.6
Fibre duct..... lin. ft.	1,450	125	1,335	8.6	92.1
Rigid metal conduit..... lbs.	1,900	22	1,816	1.2	95.6
Coffer-dams, pumping, bailing and draining..... lump sum	\$6,000	0	\$6,000	0.0	100.0
Store house..... lump sum	\$1,000	0	\$1,000	0.0	100.0
Engineer's office building..... lump sum	\$400	0	\$400	0.0	100.0
Gross estimate at contract prices.....	*\$616,255 00	\$12,027 26	\$575,806 98	2.0	93.4
<i>Extra Work Orders</i>					
Feb. 28, 1916..... cost plus 15 per cent			\$145 19		Finished
April 21, 1916..... lump sum	\$196 67		\$196 67		Finished
June 16, 1916..... contract prices	6,859 80		5,050 00		
Total.....			\$5,391 86		

\* Figures given include excess quantities authorized by the Canal Board as follows:

Foundation piles, 51,000 lin. ft., by resolution dated Aug. 4, 1914.  
 Wooden sheet-piling, 66,000 ft. B. M., by resolution dated Feb. 24, 1914.  
 Wooden sheet-piling, 225,000 ft. B. M., by resolution dated Aug. 4, 1914.  
 Structural steel, 8,000 lbs., by resolution dated Sept. 8, 1915.  
 These quantities at the contract prices amount to \$38,340.00.

*Terminal Contract No. 205*

This contract is for constructing temporary terminal warehouses at Utica and Rome. It was awarded to William R. Kimmey of Albany, N. Y., being signed on March 14, 1917. Work was begun April 21, 1917. The engineer's preliminary estimate was \$2,320.00, the contractor's bid, \$2,100.00. The contract price as modified by alteration No. 1 is \$13,906.75.

Robert E. Swinney and Lewis Bartlett, Assistant Engineers, are in charge.

Alteration No. 1, approved by the Canal Board April 17, 1917, increases the size of the warehouses. This alteration added \$11,806.75 to the contract price.

Extra work order dated May 8, 1917, provided for grading a roadway in the rear of the terminal warehouse at Utica. This work was done on the basis of cost plus 15 per cent and the payment amounted to \$64.16.

These buildings are nearly completed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
<i>Warehouse at Rome</i>			
Excavation.....cu. yds.	330	60	18.2
Forming embankment.....cu. yds.	280	0	0.0
Second-class concrete.....cu. yds.	85	78	91.8
Iron and steel fastenings.....lbs.	650	618	95.1
Painting, alteration No. 1.....lump sum	\$300	0	0.0
Carpenter work, alteration No. 1.....lump sum	\$7,363 20	\$7,363 20	100.0
Electric work, alteration No. 1.....lump sum	\$230	0	0.0
Total for Rome.....	\$9,125 70	\$8,352 00	91.5
<i>Warehouse at Utica</i>			
Excavation.....cu. yds.	200	35	17.5
Forming embankment.....cu. yds.	165	0	0.0
Second-class concrete.....cu. yds.	80	48.4	92.8
Iron and steel fastenings.....lbs.	350	324	92.6
Painting, alteration No. 1.....lump sum	\$160	\$160	100.0
Carpenter work, alteration No. 1.....lump sum	\$3,744 55	\$3,744 55	100.0
Electric work, alteration No. 1.....lump sum	\$150	0	0.0
Total for Utica.....	\$4,781 05	\$4,488 05	93.9
<i>Summary of Contract</i>			
Warehouse at Rome.....	\$9,125 70	\$8,352 00	91.5
Warehouse at Utica.....	4,781 05	4,488 05	93.9
Gross estimate at contract prices.....	\$13,906 75	\$12,840 05	92.3
<i>Extra Work Order</i>			
May 18, 1917.....cost plus 15 per cent			

*Terminal Contract No. 16-P*

This contract is for paving the terminal area at Rome. It was awarded to E. Brown Baker of Herkimer, N. Y., being signed on June 4, 1917. Work was begun on June 6, 1917. The engineer's preliminary estimate was \$3,300.00, the contractor's bid, \$3,909.50.

Lewis Bartlett, Assistant Engineer, is in charge.

Gravel has been delivered and excavation has started.

*Terminal Contract No. 101*

This contract is for furnishing and installing steel stiff-leg derricks at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker of Herkimer, N. Y., being signed on December 18, 1916, and was assigned to the Mohawk Dredge & Dock Company, Inc., of Herkimer, N. Y., on March 26, 1917. The engineer's preliminary estimate for the derrick at Rome was \$3,885.50, the contractor's bid, \$5,684.00.

Lewis Bartlett, Assistant Engineer, is in charge of the work at Rome.

This work has not yet begun.

*Construction Work—Barge Canal Terminals*

The Barge canal terminal work done on section 5 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE			
	Contract No. 15	Contract No. 16	Contract No. 205	Totals
1913.....	\$49,210	\$48,770	.....	\$97,980
1914.....	313,660	24,780	.....	338,440
1915.....	181,160	13,165	.....	194,325
1916.....	19,740	.....	.....	19,740
1917.....	12,037	.....	\$12,830	24,867
Totals.....	\$575,807	\$86,715	\$12,830	\$675,352

<i>Extra Work Orders Paid, 1913-1917, Inclusive</i>				
1916.....	\$197	.....	.....	\$197
1917.....	5,195	.....	.....	5,195
Totals.....	\$5,392	.....	.....	\$5,392

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on the contracts on this section during 1913, 1914 and 1915.

*Canal Maintenance*

On the site of contract No. 4, which covered the section of canal 4.83 miles long just east of Oneida lake and was completed in 1910, a large amount of sand has been washed into the prism. This material is being removed by the dredges belonging to the Department of Public Works and other dredges which that department has rented, the work being laid out and the quantities of excavation measured by Foster B. Crocker, Assistant Engineer in the Department of the State Engineer.

The excavation was begun about October 1, 1916, with two small hydraulic dredges. These worked at various points between Drum creek and a point one thousand feet west of Burdick's bridge, removing about 40,000 cubic yards before the middle of January, 1917, when it was necessary to close down because of ice. They resumed operations on March 10. On May 11 a 20-inch suction dredge, *No. 91*, which had been rented, began cutting a channel eight feet deep through a bar below Wood creek. This was accomplished by about June 10 and it opened a Barge canal channel of that minimum depth from Oswego to Albany. On June 16 a 16-inch dredge, the *Hanson*, which also had been rented, began excavating just west of Burdick's bridge, cleaning up the prism. About April 20 the State dredges were moved to Sylvan Beach, where they are cleaning up the prism between the breakwaters and at a bar that had formed at the Fish creek entrance. Since winter the two small dredges have excavated about 60,000 cu. yds. and the two large ones, 183,800 cu. yds.

*Highways at Rome*

This contract is for the construction of two connecting highways, Muck road to James street and Whitesboro street to Mill street, in the city of Rome. Length, one mile. It was awarded to Harry A. Schaupp of Guilderland, N. Y., being signed on January 17, 1916. Work was begun May 21, 1916. The engineer's preliminary estimate was \$28,634.55, the contractor's bid, \$32,111.15.

Henry J. O'Neill and D. J. Levinson, Assistant Engineers, have been in charge during the year.

It was found that the earth at the site of the highway between James street and Muck road was very porous and spongy, and in order to secure a firm base for the highway it was necessary to use a much larger amount of gravel than had been expected. This contract has been completed with the exception of a steel bridge, which is in course of erection.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	5,230	4,313	7,000	82.5	133.8
Forming embankment.....cu. yds.	2,460	2,139	4,000	87.0	162.6
Sawed lumber, yellow pine.....ft. B. M.	35,300	0	0	0.0	0.0
Second-class concrete.....cu. yds.	53	2	52	3.8	98.1
First-class masonry bridge coping.....cu. yds.	2.1	0	0	0.0	0.0
Second-class stone paving.....sq. yds.	50	27	27	54.0	54.0
12-inch vitrified pipe, laid.....lin. ft.	105	8	120	7.6	114.3
Structural steel.....lbs.	395,000	194,026	194,026	49.1	49.1
Metal reinforcement.....lbs.	140	5	134	3.6	95.7
Macadam pavement.....sq. yds.	8,780	8,296	8,296	94.5	94.5
Wooden fence.....lin. ft.	1,180	1,072	1,072	90.8	90.8
Lattice railing.....lin. ft.	236	0	0	0.0	0.0
Gross estimate at contract prices.....	\$32,111 15	\$18,236 67	\$20,131 07	56.8	62.7

### *Highways adjacent to Hinckley Reservoir*

This contract was for constructing certain highways adjacent to Hinckley reservoir. It was awarded to Jackson L. Richmond of Little Falls, N. Y., being signed on September 2, 1914. The engineer's preliminary estimate was \$99,120.10; the contractor's bid, \$93,981.50.

George H. Briggs, Assistant Engineer, was in charge.

The work was completed previous to July 1, 1916, but the final estimate was finished and payment made to the contractor during the past year.



VIEW FROM BELOW DELTA DAM

Delta reservoir and a chain of Adirondack reservoirs which deliver their waters through the Black River canal supply an important part of the water needed for the Barge canal in the central and eastern parts of the state. The view shows the dam across the Mohawk and a relocated portion of the Black River canal.



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The following table shows the contract and final estimate quantities:

ITEMS OF WORK	Contract quantities as modified by alterations	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
Excavation (class "A")..... cu. yds.	7,000	3,989	57.0
Excavation (class "B")..... cu. yds.	50,000	44,649	89.3
Forming embankment..... cu. yds.	41,000	37,544	91.6
Lining..... cu. yds.	670	617	92.1
Surfacing..... cu. yds.	6,800	7,130	104.9
Second-class concrete..... cu. yds.	2,400	2,418.6	100.8
Reinforced concrete..... cu. yds.	55	72.9	132.5
Dry masonry..... cu. yds.	80	9.6	12.0
Riprap..... cu. yds.	1,730	1,359	78.6
12-inch stone paving..... sq. yds.	270	265	98.1
Cobblestone paving..... sq. yds.	1,390	222	16.0
Pointing dry masonry..... sq. yds.	330	0	0.0
Cast-iron pipe..... lbs.	46,500	42,082	90.5
Metal reinforcement..... lbs.	6,840	6,379	93.3
Structural steel..... lbs.	10,880	3,368	31.0
Wooden fence..... lin. ft.	10,770	10,218	94.9
Vitrified pipe underdrain..... lin. ft.	2,600	1,771	68.1
Wrought-iron pipe railing..... lin. ft.	110	45	40.9
Sawed lumber..... ft. B. M.	31,000	16,832	54.3
Sheeting and bracing..... ft. B. M.	31,000	13,313	42.9
Clearing..... lump sum	\$500	\$500	100.0
Maintaining highway traffic..... lump sum	\$1,000	\$1,000	100.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$1,000	\$1,000	100.0
Removing bridges..... lump sum	\$1,500	\$1,500	100.0
Erecting McIntosh bridge..... lump sum	\$2,000	\$2,000	100.0
Raising bridges..... lump sum	\$2,000	\$2,000	100.0
Foundation piles..... lin. ft.	3,300	1,218	36.9
Wooden sheet-piling..... ft. B. M.	2,000	0	0.0
Round timber bracing..... lin. ft.	2,000	1,154	57.7
Removing building..... lump sum	\$10	\$10	100.0
Gravel surfacing..... cu. yds.	1,400	1,320	94.3
Pipe line and well at Grant..... lump sum	\$180	\$180	100.0
Gross estimate at contract prices.....	\$96,079 50	\$85,989 75	89.5

ERIE CANAL, RESIDENCIES NOS. 6 AND 7; OSWEGO CANAL  
RESIDENCY

Senior Assistant Engineer L. C. Hulburd reports:

Previous to June 30, 1916, work was completed on 38 of the 51 contracts into which construction work within the limits of these residencies has been divided. Supervising of construction on the 13 uncompleted contracts has required the maintaining of 7 field offices, located at Cleveland, Syracuse, Baldwinsville, Port

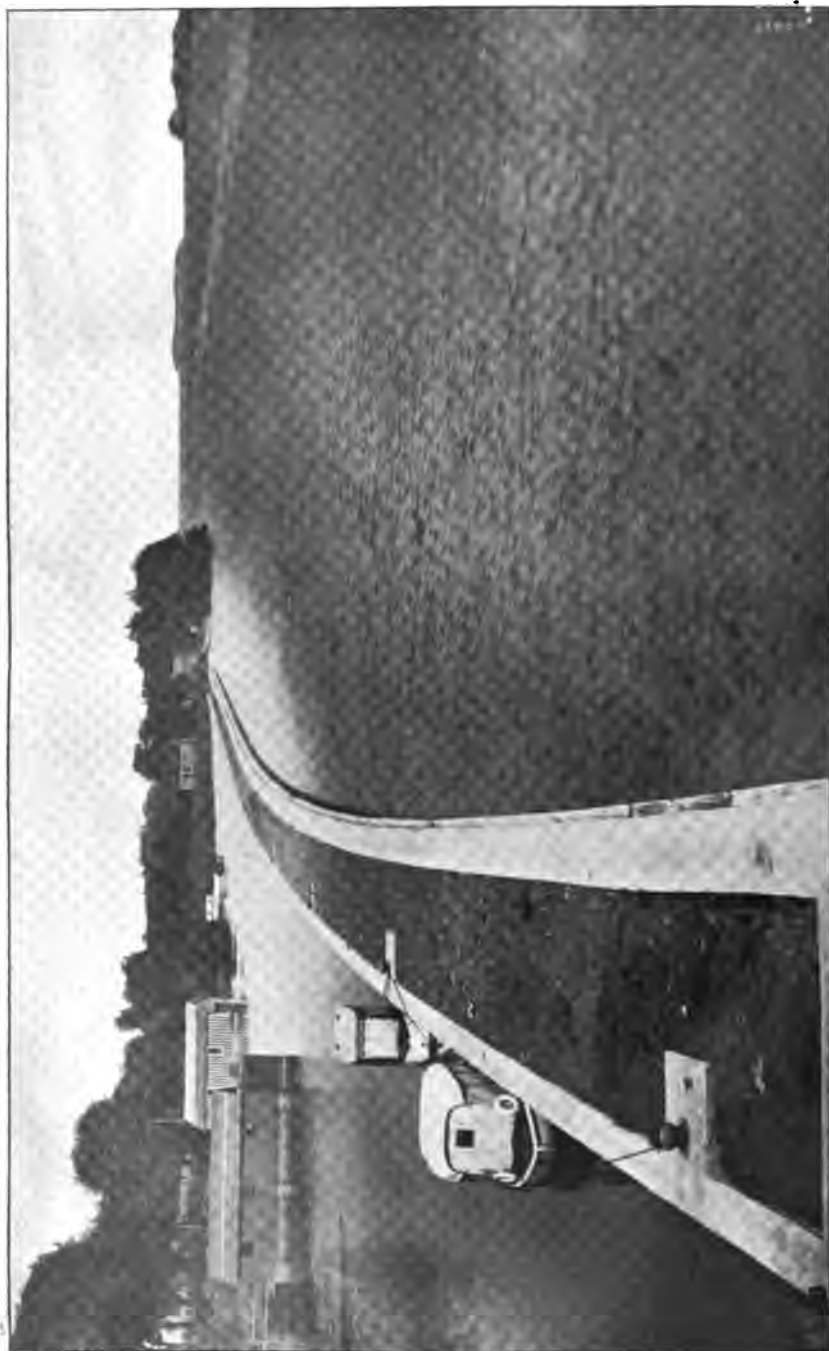


Byron and May's Point, on the Erie canal, and at Oswego and Minetto on the Oswego canal. The number of men assigned to each office has varied, depending on the amount and nature of the construction being done.

The Oswego canal and the portion of the Erie canal within residencies Nos. 6 and 7 is almost entirely lakes and canalized rivers. The dams which have been constructed to maintain the pools at navigable stages have given rise to a great many claims for alleged flooding of lands along the rivers. Establishing the limits of the State's liability in such cases and preparing defense for unwarranted claims has required extensive surveys. Where surveys indicate that damages have occurred, maps are being prepared for the appropriation of the lands, either to gain full title or a perpetual right to flood. These surveys are being made by construction corps during such time as supervision of construction will permit. On contract No. 12 such survey work has been so extensive as to require the maintaining of field office with party after the completion of the construction.

As a matter of record standard final estimate computations have been made of work done on canceled contracts Nos. 10 and 46.

Field office quarters at Phoenix and Cleveland were destroyed by fire during the year. The fire at Cleveland occurred during mid-forenoon and practically all State property was removed without damage. At Phoenix the mounted topographical maps and final estimate cross-sections for contract No. 39 were removed, but other State property, aside from field note-books and computation books, which were in the safe, was destroyed. The covers on the books in the safe were scorched, but the contents are intact. Many maps and miscellaneous records, which were removed to Phoenix at the time the Fulton office was closed, were destroyed. In general these were not of value for permanent record and I do not anticipate that it will be necessary to reproduce many of them. After the fire, headquarters for the Phoenix force was transferred to Baldwinsville.



**BARGE CANAL CHANNEL AT THE WESTERN END OF ONEIDA LAKE**

At the dockwall seen in the view boats may tie up, if necessary, to await favorable weather on the lake. A similar dock lines the other side of the channel. Frenchman's island appears on the far horizon.

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*Contract No. 132*

This contract is for constructing lighthouses, range towers, beacons, etc., and for furnishing and installing buoys and lighting equipments for aids to navigation on Oneida and Onondaga lakes. It was awarded to Lupfer & Remick of Buffalo, N. Y., being signed on November 3, 1916. The engineer's preliminary estimate was \$63,937.00, the contractor's bid \$70,330.20.

W. J. Durkan, Assistant Engineer, is in charge.

The principal field construction parts of the contract are three 80-foot reinforced concrete towers, one located at each end of Oneida lake and one on Frenchman's island, about three-quarters of the distance across the lake in going from the eastern to the western end. In addition to these concrete towers, light steel towers are provided at Cleveland and Constantia, on the northerly shore of Oneida lake, and a similar tower at the southerly end of Onondaga lake. At other points the line of navigation is marked with lights mounted on gas-filled buoys or with lights placed on top of steel cabinets housing the gas-supply.

The lights are all gas, except those at the southern end of Onondaga lake, where electric lights are to be used.

Over 50 per cent of the amount of the contract is for factory-built work, which reaches the site practically complete, ready to be placed.

Field construction began October 30, 1916. It has been carried on continuously to date, but during a large portion of the time only a small force has been employed. One of the concrete towers has been finished and a second poured for about half its height. Two of the steel towers have been erected and seven of the ten buoys placed in Oneida lake. The concrete towers are all of the same dimensions. Forms for one tower complete were mill-built and shipped in sections, ready for erection. The outside forms were erected in lifts of 18 feet, which is the distance between joints, and the inside forms in lengths of 4½ feet, these being placed as the pouring of concrete progressed. Concrete was elevated in a timber tower and spouted into place.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing.....	lump sum \$50	0	0.0
Coffer-dams, pumping, bailing and draining.....	lump sum \$800	\$840	90.0
Excavation.....	cu. yds. *3,000	2,103	70.1
Sheeting and bracing.....	ft. B. M. *16,500	6,481	39.3
Foundation piles, 20 feet long.....	lin. ft. 1,000	320	32.0
Wooden sheet-piling.....	ft. B. M. 8,000	7,234	90.4
Second-class concrete.....	cu. yds. *470	444	94.5
First-class reinforced concrete.....	cu. yds. 370	200	54.1
Metal reinforcement.....	lbs. 9,800	4,783	48.8
Structural steel.....	lbs. 45,000	23,707	52.7
Iron castings.....	lbs. 3,600	2,484	69.0
Wrought-iron chain.....	lbs. 3,300	945	28.6
Metal duct.....	lbs. 200	0	0.0
Armored cable.....	lbs. 8,000	0	0.0
Lead-covered cable.....	lbs. 300	0	0.0
Trenching and backfilling for duct and cable.....	lin. ft. 3,200	0	0.0
Doors, windows and hardware for lighthouses.....	houses 3	0	0.0
Short spar buoys.....	No. 5	2.9	58.0
Double cone buoys.....	No. 4	2.9	72.5
River type buoys.....	No. 1	0.95	95.0
Lighting equipments for Sylvan Beach and Frenchman's island lighthouses.....	No. 2	0	0.0
Lighting equipments for Cleveland and Constantia rear ranges.....	No. 2	1	50.0
Lighting equipments for Brewerton ranges.....	No. 2	1.75	87.5
Steel cabinet lighting equipments with ground Fresnal lenses.....	No. 2	2	100.0
Steel cabinet lighting equipments with pressed Fresnal lenses.....	No. 5	2	40.0
Lighting equipment for Syracuse rear range.....	lump sum \$550	0	0.0
Lighting equipment for Syracuse front range.....	lump sum \$350	0	0.0
Lighting equipment for pile clusters.....	No. 2	0	0.0
Gross estimate at contract prices.....	*\$72,657 70	\$40,270 30	55.4

\* Figures given include excess quantities authorized by the Canal Board, as follows:  
 Excavation, 1,500 cu. yds., by resolution dated June 27, 1917.  
 Sheeting and bracing, 11,500 ft. B. M., by resolution dated June 27, 1917.  
 Second-class concrete, 150 cu. yds., by resolution dated June 6, 1917.  
 These quantities at the contract prices amount to \$2,327.50.

#### Contract No. 158

The portion of this contract in these residencies provided for furnishing and delivering at Phoenix 18 red and 23 black barrel buoys, 26 red and 16 black lamp posts, and 1,000 feet of mooring cable, for aids to navigation on the Oneida, Seneca and Oswego rivers. It was awarded to James McKinney & Son of Albany, N. Y., being signed on March 22, 1917. The engineer's preliminary estimate was \$2,987.00 for the part on this residency, the contractor's bid, \$2,398.35.

This contract was accepted by the Canal Board and the final estimate approved June 22, 1917, the amount being the same as the contractor's bid.

The materials were all delivered in accordance with the terms of the contract.



**BARGE CANAL, CONTRACT No. 132**

Lighthouse on Frenchman's island — one of three lighthouses to mark the sailing courses across Oneida lake. Each lighthouse is about 85 feet high. Those at Sylvan Beach and Frenchman's island display occulting white lights of 1,500 candle-power; that at Brewerton carries a fixed red light of 1,000 candle-power.

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*Contract No. 153*

This contract is for furnishing and delivering oil-burning lanterns for buoys, stake and bridge lights on the Mohawk, Oneida, Seneca and Oswego rivers. It was awarded to R. B. Wing & Son, Albany, N. Y., being signed on February 28, 1917. The engineer's preliminary estimate was \$12.00 per lantern, or \$1,116.00 for the part on this residency, the contractor's bid, \$12.54 per lantern, or \$1,166.22.

*Contract No. 22*

Contract No. 22 was accepted by resolution of the Canal Board on March 29, 1916, and final payment, amounting to \$116,882.09, was approved on December 28, 1916. The details of the final estimate are the same as printed in the Report of the State Engineer for 1916 at page 177. There remains, however, the repainting of Bonta's and State Ditch bridges, which was provided for under an extra work order dated March 2, 1916. This painting was begun on Bonta's bridge in June, 1916, but work was suspended before the end of the month and nothing further was done until May, 1917, when painting was resumed and about 50 per cent of Bonta's bridge completed, after which time work was again suspended. The scaffold has not been removed and the contractor claims that lack of progress is due to difficulty in obtaining help.

*Contract No. 46-A*

This contract is for completing the construction of the canal from Fox Ridge to the Montezuma aqueduct, a distance of 4.49 miles. It was awarded to James Stewart & Co., Inc., of New York city, being signed on September 2, 1914. The engineer's preliminary estimate was \$333,941.50, and the contractor's bid, \$196,133.50.

J. G. Palmer, Assistant Engineer, is in charge.

The work consists of excavating the canal prism and placing slope protection about the abutments of three railroad bridges spanning the canal. The contractor began construction work in July, 1915. The excavation was made by a 20-inch hydraulic



dredge. At a few points, where hard material was encountered, a dipper-dredge was used to loosen the material, after which it was removed by the hydraulic dredge.

At the N. Y. C. R. R. bridge the easterly abutment wings were extended to the top of the prism slope. These wings are founded on piles with sheet-piling cut-off underneath the masonry. The material is light loam and fine sand and while the dredge was excavating near the westerly wing a settlement occurred in the slope of the railroad fill back of the wing. A section of the wing wall was displaced two or three inches and some material moved from under the wall into the prism. Excavation was immediately stopped and the slope in front of the wing built up with gravel and broken stone obtained from a near-by abandoned railroad bed. The shoulder of the railroad fill was rebuilt. This work was done under the extra work order of September 11, 1916. It is now nearly a year since these repairs were made and no further difficulty has been experienced.

Some 13,500 feet of contract No. 46-A is new location, cutting across a bend of the Seneca river. There was a fall of about five feet in the portion of river cut off. The dredge entered the cut from the upper end, carrying the high level through to the easterly end. The ground surface at this point was about one foot above the surface of the upper level and when the prism cuts were about 75 feet apart a surface ditch was made by hand, connecting them. The marl and clay through which this ditch was cut did not erode sufficiently to lower the upper pool and before the water-surfaces were equalized it was necessary to excavate the entire bank between them. This excavation was done by the hydraulic dredge, the machine being held on the crest of the five-foot waterfall by means of guys and the spuds.

Excavation has been under way throughout the year except during winter months, and the construction has progressed to such an extent that it is expected the contract will be completed before the first of September.

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The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$100	0	0	0.0	0.0
Excavation..... cu. yds.	783,000	557,564	660,168	71.2	84.3
Sheeting and bracing..... ft. B. M.	*14,400	0	13,600	0.0	94.4
Forming embankment..... cu. yds.	*250	0	222	0.0	88.8
Foundation piles..... lin. ft.	1,620	0	1,200	0.0	74.0
Wooden sheet-piling..... ft. B. M.	10,700	0	11,500	0.0	107.5
First-quality steel sheet-piling..... sq. ft.	8,400	85	7,608	1.0	90.5
Second-quality steel sheet-piling..... sq. ft.	2,850	0	3,173	0.0	111.3
Second-class concrete..... cu. yds.	310	0	307	0.0	99.0
Second-class riprap..... cu. yds.	1,800	593	593	32.9	32.9
Coffer-dam, pumping, bailing and draining, lump sum	\$1,300	0	\$1,300	0.0	100.0
Deduct for sheeting and bracing, reused, ft. B. M.	.....	0	4,600	.....	.....
Gross estimate at contract prices.....	*\$196,401 50	\$125,256 80	\$157,751 90	63 8	80.3
<i>Extra Work Order</i>					
Sept. 11, 1916..... lump sum	\$399 38	.....	\$399 38	.....	Finished

\* Figures given include excess quantities authorized by the Canal Board, as follows:  
 Sheeting and bracing, 5,000 ft. B. M., by resolution dated November 18, 1915.  
 Forming embankment, 120 cu. yds., by resolution dated November 18, 1915.  
 These quantities at the contract prices amount to \$268.00.

Contract No. 46-B

This contract is for the construction of lock, dam, etc., at May's Point. Length, 0.66 mile. It was awarded to Scott Bros. of Rome, N. Y., being signed on February 25, 1916. Work began April 27, 1916. The engineer's preliminary estimate was \$314,-660.72, the contractor's bid, \$277,348.22.

J. G. Palmer, Assistant Engineer, is in charge.

Extra work order dated January 17, 1917, provided for moving electrical and mechanical equipment stored in the basement of the power-house at lock No. 25 to the upper floor of this power-house and for installing stove to keep the equipment dry.

Construction work commenced with the starting of the pumps to unwater the lock site on April 27, 1916, and has been carried on continuously to date. The contract is for the completion of work embraced in old contract No. 46 and includes the masonry and steelwork of the lock and connections, together with portions of the approach walls not built under contract No. 46, the superstructure of a movable dam in the Seneca river, a highway bridge

with approaches over the lock, and the cleaning of prism, removal of coffer-dam, etc.

At the close of the fiscal year lock masonry has been placed from the upper end of the lock to the lower needle-sill, the upper approach walls have been completed, and about 40 lin. ft. of the lower southerly approach wall finished.

No especial difficulties have been encountered aside from securing and holding help in the isolated location. Materials are delivered by boat on the Erie canal. Excavation and placing of concrete have been done by truck-mounted, timber, traveling derricks. Materials are moved over the site by 3-ft. gage cars and locomotives. The contract period is 18 months. At the close of the fiscal year 89 per cent of the time had expired, and estimates rendered for 52 per cent of the total amount of the contract.

Electrical equipment for lock No. 25, which had been delivered under another contract and stored in the basement of the power-house, was being injured by moisture. Under the extra work order of January 17, 1917, this equipment was moved to the generator room of the power-house and a fire maintained until it was dried out.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....	lump sum \$50	0	0	0.0	0.0
Excavation.....	cu. yds. 84,500	21,118	22,183	25.0	26.3
Sheeting and bracing.....	ft. B. M. *181,700	143,900	153,400	79.2	84.4
Forming embankment.....	cu. yds. 54,800	14,346	15,420	26.3	28.2
Lining.....	cu. yds. 400	0	0	0.0	0.0
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	25,800	0	0	0.0	0.0
White oak sawed lumber in miter sills, lock-gates and movable dam gates.....	ft. B. M. 15,700	0	0	0.0	0.0
Sawed lumber in needles.....	ft. B. M. 18,000	0	0	0.0	0.0
Stone or gravel filling.....	cu. yds. 3,850	2,625	2,644	68.2	68.7
Foundation piles.....	lin. ft. 119,800	55,906	55,906	46.7	46.7
Moorings piles.....	No. 20	0	0	0.0	0.0
Wooden sheet-piling.....	ft. B. M. 119,400	6,400	102,300	5.4	85.7
Driving steel sheet-piling.....	sq. ft. 13,900	9,932	9,932	71.5	71.5
Cutting off steel sheet-piling.....	lin. ft. 1,000	883	883	88.3	89.3
Second-class concrete.....	cu. yds. 18,780	13,540	13,540	72.1	72.1
First-class reinforced concrete.....	cu. yds. 13	0	0	0.0	0.0
First-class masonry bridge coping.....	cu. yds. 1.7	0	0	0.0	0.0
Fourth-class riprap.....	cu. yds. 280	0	0	0.0	0.0
Structural steel.....	lbs. 361,500	394	394	0.1	0.1
Metal reinforcement.....	lbs. 16,200	7,938	7,938	49.0	49.0
Cast steel snubbing-posts.....	lbs. 12,800	0	0	0.0	0.0
Wooden fence.....	lin. ft. 1,600	0	0	0.0	0.0
Wrought-iron chains.....	lbs. 6,000	0	0	0.0	0.0

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ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Finishing concrete surfaces.....sq. ft.	14,500	0	0	0.0	0.0
Hauling and erecting metal in buffer-beams. lbs.	90,000	0	0	0.0	0.0
Hauling and erecting metal in lock-valves. lbs.	25,000	0	0	0.0	0.0
Hauling and erecting metal in lock-gates. lbs.	188,000	0	0	0.0	0.0
Hauling and erecting iron castings, machined, lbs.	6,600	6,120	6,120	92.7	92.7
Hauling and erecting metal in truss span over lock 25. lbs.	43,000	0	0	0.0	0.0
Hauling and erecting miscellaneous metal. lbs.	6,178	0	0	0.0	0.0
Machinery.....lbs.	25,000	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining, lump sum	\$24,000	\$12,000	\$12,480	50.0	52.0
Maintaining highway traffic.....lump sum	\$150	0	0	0.0	0.0
Deduct for gravel furnished by the State, lump sum	\$1,600	0	0	0.0	0.0
Deduct for sheeting and bracing, reused, ft. B. M.	.....	56,000	56,000	.....	.....
Gross estimate at contract prices.....	*\$279,598 22	\$137,802 77	\$144,199 47	49.3	50.2
<i>Extra Work Order</i>					
Jan. 17, 1917.....cost plus 15 per cent	.....	.....	\$124 55	.....	Finished

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Sheeting and bracing, 45,000 ft. B. M., by resolution dated March 1, 1917.  
This quantity at the contract price amounts to \$2,250.00.

Construction Work — Barge Canal

The Barge canal work done on section 6 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						
	Contract No. 12 (section 6)	Contract No. 13 (section 6)	Contract No. 22 (section 6)	Contract No. 45	Contract No. 57	Contract No. 90 (section 6)	Contract No. 93 (section 6)
1908.....	\$122,560	.....	.....	\$47,490	.....	.....	.....
1909.....	423,840	.....	.....	294,380	.....	.....	.....
1910.....	196,580	\$7,330	.....	76,782	.....	\$430	.....
1911.....	545,420	2,920	.....	.....	.....	24,880	.....
1912.....	286,670	3,230	.....	.....	.....	4,580	.....
1913.....	143,830	.....	\$3,050	.....	\$61,120	74	\$400
1914.....	158,100	.....	530	.....	27,140	.....	14,290
1915.....	70,285	.....	.....	.....	5,055	.....	29,800
1916.....	.....	.....	41	.....	.....	.....	541
1917.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	\$1,946,285	\$13,480	\$3,621	\$418,662	\$93,315	\$29,964	\$45,031
<i>Extra Work Orders Paid, 1908-1917, Inclusive</i>							
1909.....	\$329	.....	.....	.....	.....	.....	.....
1910.....	.....	.....	.....	\$367	.....	.....	.....
1912.....	.....	.....	.....	.....	.....	\$724	.....
1913.....	.....	.....	.....	.....	.....	320	.....
1914.....	.....	.....	\$90	.....	.....	.....	.....
1915.....	.....	.....	.....	.....	.....	.....	.....
1916.....	\$2,707	.....	25	.....	.....	.....	.....
Totals.....	\$3,036	.....	\$115	\$367	.....	\$1,044	.....

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YEAR*	VALUE OF WORK DONE					Totals
	Contract No. 100 (section 6)	Contract No. 101	Contract No. 121	Contract No. 132 (section 6)	Contract No. 158 (section 6)	
1908.....						\$170,050
1909.....						718,220
1910.....						280,122
1911.....						573,220
1912.....		\$3,300				297,780
1913.....		20,430				228,904
1914.....	\$37,730	14,520				252,310
1915.....	65,900	900	\$9,051			180,991
1916.....	296					878
1917.....				\$36,470	\$2,398	38,868
Totals.....	\$103,926	\$39,150	\$9,051	\$36,470	\$2,398	\$2,741,343

<i>Extra Work Orders Paid, 1908-1917, Inclusive</i>						
1909.....						\$329
1910.....						867
1912.....						724
1913.....		\$941				1,231
1914.....						90
1915.....		564	\$59			623
1916.....	\$76					2,803
Totals.....	\$76	\$1,505	\$59			\$6,703

\* The years 1908 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period ended June 30; and 1917 is a twelve-month, period ended June 30.

NOTE.—No extra work orders were paid on this section during 1908, 1911 and 1917.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 12, section 7, Erie canal; contract No. 13, section 4, Erie; contract No. 22, section 7, Erie; contract No. 90, section 3, Champlain, and section 1, Oswego; contract No. 93, sections 5 and 7, Erie, and section 1, Oswego; contract No. 100, section 1, Oswego; contract No. 132, section 5, Erie; contract No. 158, section 4, Erie.

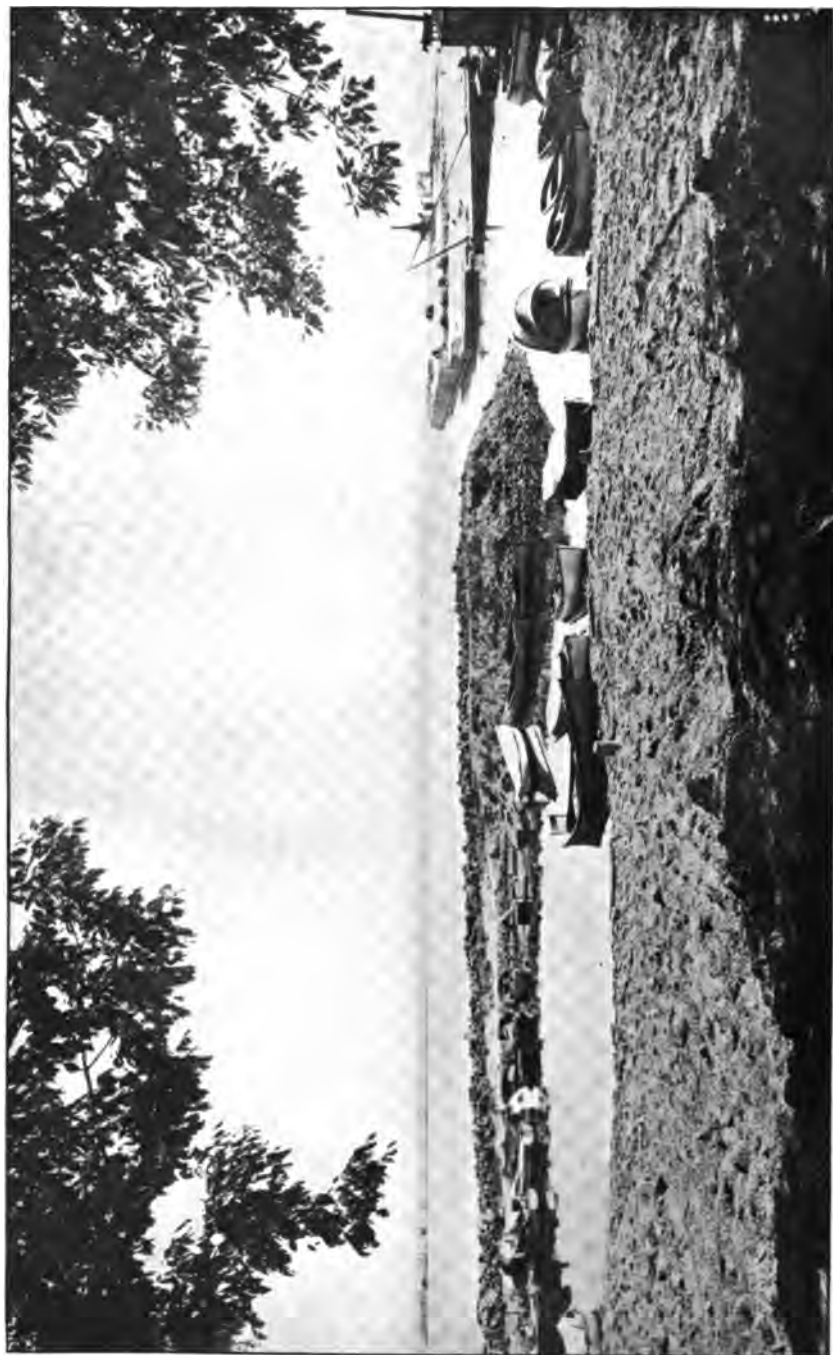
*Construction Work — Barge Canal*

The Barge canal work done on section 7 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						
	Contract No. 5	Contract No. 5-A	Contract No. 7 (section 7)	Contract No. 12 (section 7)	Contract No. 22 (section 7)	Contract No. 22 (special) †	Contract No. 22-A
1906.....	\$11,390						
1907.....	104,920						
1908.....	9,510		\$9,877	\$137,480			
1909.....				180,590			
1910.....				170,090			
1911.....				345,270	\$14,960		
1912.....		\$239,990		191,010	25,540	\$7,000	
1913.....		79,361		91,230	35,250	5,447	\$21,630
1914.....				31,540	19,590		4,800
1915.....				8,942	9,990		554
1916.....					7,931		
1917.....							
Totals.....	\$125,820	\$319,451	\$9,877	\$1,136,152	\$113,261	\$12,447	\$26,984

<i>Extra Work Orders Paid, 1906-1917, Inclusive</i>						
1908.....			\$50		\$2,310	
1913.....						
1914.....						\$886
1915.....				1301	3,355	
1916.....						
1917.....						
Totals.....			\$50	\$308	\$5,665	\$886



BARGE CANAL, TERMINAL CONTRACT NO. 28 — CLEVELAND

General view of the terminal, showing the dockwall at the right and the breakwater in the distance at the left.



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YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 46	Contract No. 46-A	Contract No. 46-B	Contract No. 93 (section 7)	Contract No. 102	Contract No. 116	
1906.....							\$11,390
1907.....							104,920
1908.....							156,867
1909.....	\$155,920						336,510
1910.....	200,590						370,680
1911.....	249,450						609,680
1912.....	128,760						592,300
1913.....	107,969						340,887
1914.....				\$13,090	\$24,534	\$18,540	112,094
1915.....		\$7,060		24,720		58,132	109,398
1916.....		25,430	\$6,390	51			39,802
1917.....		125,260	137,800				263,060
Totals.....	\$842,689	\$157,750	\$144,190	\$37,861	\$24,534	\$76,672	\$3,047,588

## Extra Work Orders Paid, 1906-1917, Inclusive

1906.....							\$50
1913.....							2,310
1914.....					\$26		23
1915.....						\$612	886
1916.....							4,275
1917.....		\$899	\$125				1,024
Totals.....		\$899	\$125		\$26	\$612	\$8,571

\* The years 1906 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period ended June 30; and 1917 is a twelve-month period, ended June 30.

† This was an emergency contract for safeguarding the superstructure of the Weedsport bridge.

NOTE.—No extra work orders were paid on this section during 1906, 1907, 1909, 1910, 1911 and 1912.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 7, sections 1, 5 and 9, Erie canal, and section 2, Champlain; contracts Nos. 12 and 22, section 6, Erie; contract No. 93, sections 5 and 6, Erie, and section 1, Oswego.

## Terminal Contract No. 28 — Cleveland

This contract is for constructing a harbor, dockwall and two breakwaters on Oneida lake at Cleveland. It was awarded to Clarence E. Gruner of Albany, N. Y., being signed on February 15, 1915, and was assigned to Barrally & Ingersoll of Rochester, N. Y., on March 15, 1915. Work began in June, 1915. The engineer's preliminary estimate was \$34,575.00, the contractor's bid, \$30,673.00. The contract price as modified by alterations Nos. 1 and 2 is \$37,222.00.

W. J. Durkan, Assistant Engineer, is in charge.

The dock consists of a concrete wall 160 feet long, located on the westerly side of a small indentation of the shore line. The wall is founded on stone-filled cribs. Back of the wall is a fill



which is graded and surfaced for a width of 75 feet and protected with riprap at its southerly end. The breakwaters were to be filled with material from the harbor excavation, but this was found to be unsuitable and the filling was changed to stone by alteration No. 1, which was approved by the Canal Board March 30, 1915, and increased the contract price by \$2,010.00.

The contract has been further modified by alteration No. 2, approved by the Canal Board November 2, 1916, which provides for relocating the dockwall so as not to disturb old existing cribs found in the excavation, making corresponding changes in the location of the breakwater, widening the channel and substituting concrete blocks for riprap on the breakwater cribs. This alteration increased the amount of the contract price by \$4,539.00.

Extra work order dated March 12, 1917, provided for the construction of 50 concrete anchors, to be used for buoys. Payment, which was approved by the Canal Board June 6, 1917, amounted to \$240.00.

The dockwall and breakwater cribs have been sunk and filled, the dockwall constructed, fill back of dockwall made to the subgrade of surfacing, concrete top placed on one breakwater crib, and channel and harbor excavated nearly to grade.

Excavation has been done by two small dredges, one being a hydraulic and the other a dipper-dredge. The hulls of these dredges consist of twin pontoons, or scows, which are of such size that upon removal of the machinery they can be detached and shipped by rail. Some boulders and a small amount of material which these machines cannot excavate have been found near prism grade and other plant will have to be obtained before the excavation can be finally completed.

Construction has progressed very slowly, but has now reached such a point that, by the placing of surfacing, the dock could be used.



BARGE CANAL, TERMINAL CONTRACT NO. 20—SYRACUSE

View of the site of the terminal before construction was begun, showing the vats with sliding covers used in the manufacture of salt by solar evaporation.

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The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation..... cu. yds.	31,000	11,991	26,730	38.7	86.2
Sawed lumber..... ft. B. M.	26,000	3,700	17,900	14.2	68.8
Round timber..... lin. ft.	55,000	18,270	48,811	33.2	88.7
Second-class concrete..... cu. yds.	820	226	226	27.6	27.6
Stone filling..... cu. yds.	*4,530	1,017	3,913	22.5	86.4
Second-class riprap..... cu. yds.	*550	487	487	88.5	88.5
Iron castings, plain..... lbs.	1,500	870	870	58.0	58.0
Gravel surfacing..... cu. yds.	550	0	280	0.0	50.9
Gross estimate at contract prices.....	*\$38,907 00	\$13,447 45	\$28,796 56	34.6	74.0
<i>Extra Work Order</i>					
Mar. 12, 1917.....special unit prices	\$240	.....	\$240	.....	Finished

\* These figures include excess quantities authorized by the Canal Board, as follows:  
 Stone filling, 810 cu. yds., by resolution dated Aug. 24, 1915.  
 Second-class riprap, 250 cu. yds., by resolution dated June 6, 1917.  
 These quantities at the contract prices amount to \$1,685.00.

*Terminal Contract No. 29 — Constantia*

This contract is for constructing a harbor, dockwall and two breakwaters on Oneida lake at Constantia. It was awarded to Barrally & Ingersoll, of Rochester, N. Y., being signed on November 27, 1914. The engineer's preliminary estimate was \$43,573.50, the contractor's bid, \$38,733.50. The contract price as modified by alteration No. 1 is \$39,793.50.

W. J. Durkan, Assistant Engineer, is in charge.

The plans provide for construction very similar to the terminal at Cleveland, which is being built under contract No. 28.

Alteration No. 1, approved by the Canal Board March 30, 1915, provided for substituting stone filling in the breakwater cribs in the place of spoil from the harbor excavation, also for changing the spacing of the vertical sheathing on the inside of breakwater cribs and for changing the position of the dockwall and channel. It increased the contract price by \$1,060.00

During the winter of 1915 some crib timber and stone filling were delivered on the shore adjacent to the site, but construction did not commence until May, 1916, when a dipper-dredge was placed in operation on the dock site. This dredge was an antiquated machine, not capable of making much steam in excess of

that required to keep it afloat, and on September 23, 1916, after it had excavated about 8,500 cu. yds. of the 42,000 cu. yds. estimated in the contract, all work was suspended. At that time also, about 75 per cent of the framing on one short crib had been done. The machinery was removed from the dredge as junk and the hull has sunk on the site.

The following table shows the contract quantities, work done during the year and to date, with percentages:

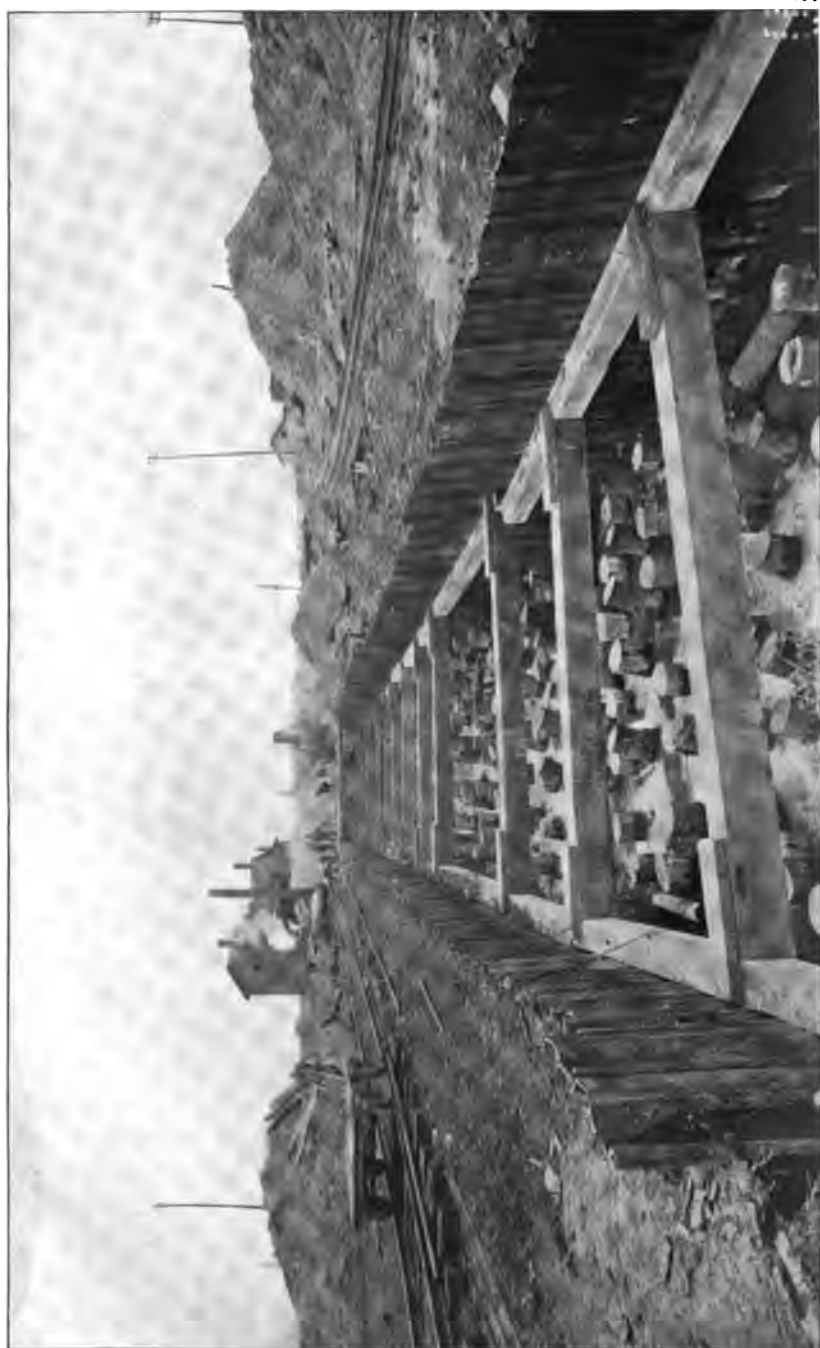
ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	42,000	6,120	8,518	14.6	20.3
Sawed lumber.....ft. B. M.	17,000	0	0	0.0	0.0
Round timber (cribs).....En. ft.	50,000	0	0	0.0	0.0
Second-class concrete.....cu. yds.	240	0	0	0.0	0.0
Stone filling.....cu. yds.	3,610	0	0	0.0	0.0
Second-class riprap.....cu. yds.	1,500	0	0	0.0	0.0
Iron castings, plain.....lbs.	1,170	0	0	0.0	0.0
Gross estimate at contract prices.....	\$39,793 50	\$2,448 00	\$3,407 20	6.2	8.6

#### *Terminal Contract No. 20 — Syracuse*

This contract is for constructing a terminal basin with a connecting channel to Onondaga lake, piers, dockwalls, spillway and a highway bridge at Syracuse. Length, from the southerly end to deep water in Onondaga lake, 5,600 feet. It was awarded to the Walsh Construction Co., Inc., of Davenport, Iowa, being signed on November 4, 1915, and work being started the same month. The engineer's preliminary estimate was \$665,875.00, the contractor's bid, \$419,659.00. The contract price as modified by alterations Nos. 1, 2 and 3 is \$566,753.26.

A. G. Card, Assistant Engineer, is in charge.

The information obtained from borings and preliminary surveys showed that the character of the material on which the dockwalls were to be founded was so unsatisfactory that it was decided to prepare plans for both crib and pile construction. Accordingly the preliminary estimate quantities were based on the assumption of half the structure being founded on cribs and half on piles. As construction progressed and foundations were developed it was decided to use piles for the entire structure.



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Alteration No. 1, approved by the Canal Board February 23, 1916, made the necessary changes in the quantities in order to effect this change in foundation plans. It increased the amount of the contract price by \$180,572.20.

The contract has been further modified by the following alterations:

Alteration No. 2, approved by the Canal Board November 21, 1916, provides for furnishing suitable material to form the fill adjacent to the New York Central railroad embankment, and for placing cinders below gravel surfacing at the terminal site. This alteration increases the amount of the contract price by \$25,163.

Alteration No. 3, approved by the Canal Board April 25, 1917, provides for eliminating excavation provided under alteration No. 2; for eliminating wash wall; for payment for coffer-dams at Onondaga creek spillway; for placing riprap at N. Y. C. railroad; for constructing drains; for removing concrete piles, and for loading test piles. This alteration decreases the amount of the contract price by \$8,640.94.

Extra work order dated December 13, 1915, provides for changing the 27-inch sewer at Hiawatha avenue to suit the substructure of the bridge abutment and retaining wall along terminal channel.

Extra work order dated January 10, 1916, provides for the construction of a field office building.

Construction began in November, 1915, and has been carried on continuously to date. The dockwalls have been completed and about 50 per cent of the grading and surfacing back of them done. Hiawatha street bridge has been erected and is complete except for concrete back wall on west abutment, wings of west pier and filling approaches. Traffic is being carried on a temporary bridge.

In constructing the docks and bridge substructure, 9,350 40-foot foundation piles and 3,707 pieces of 14-inch, Lackawanna, arched-web, steel sheet-piles, 21 feet long, have been driven.

The plans provide for a spillway at the southerly end of the contract, where Onondaga creek is to flow into the harbor. After diverting this stream, the old creek bed is to be filled. Spoil is also to be placed along the lake side of the N. Y. C. railroad fill, which crosses the harbor entrance channel near the lake shore.



Through an arrangement between the Walsh Construction Co. and James Stewart & Co., Inc., the latter firm was to do the dredging required by the contract. In the early part of August, 1916, a 20-inch hydraulic dredge began the excavation of the entrance channel to the harbor and six weeks later it cut into an old channel of Onondaga creek, which crosses the harbor entrance channel about midway between the lake and the proposed spillway. This permitted the diversion of the creek into the new channel and the filling of the portion of the creek bed north of Hiawatha avenue. Previous to this an attempt had been made to place the fill along the N. Y. C. railroad embankment between the harbor entrance and the mouth of Onondaga creek, but the character of the excavated material was such that it could not be confined within the limited area of the fill. After diverting the creek, the area of fill along the railroad was extended to a length of about 2,000 feet and a second attempt was made to place the fill by means of the hydraulic dredge. The excavated material was so soft that heavy dikes were required to hold it and these could not be maintained. It was then proposed to make the fill along the railroad embankment from heavy material in the bottom of the harbor and slip excavation. In order to place this material it would be necessary to rehandle it and this work was provided for by alteration No. 2. Later an agreement was entered into with the railroad company which eliminated the fill along the lake and the rehandling of this spoil was eliminated under alteration No. 3.

A dipper-dredge was brought onto the contract in October and some work done in cutting slopes, the material being deposited in the channel, to be removed later by the hydraulic dredge.

After excavating a channel from the lake to the southerly side of the turning basin, the arrangement with James Stewart & Co., Inc., was canceled and the dredges removed from the contract on November 2, 1916.

There has been nothing done on the excavation of the channel since then, but the contractor advises me that he has made an arrangement with Grant Smith Company & Locher to complete the dredging and that a 20-inch hydraulic dredge is now on its way from Rome. About five weeks' work with such a dredge



BARGE CANAL, TERMINAL CONTRACT NO. 20 — SYRACUSE  
Testing the bearing power of piles used in the dockwall foundation.



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ought to complete an eight-foot channel from the lake and excavate one of the slips. That would permit the opening of the terminal, but as the streets which will provide access to the docks have not been opened by the city, it is doubtful if any shipping through the terminal will take place this season.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing.....	lump sum \$50	0	0	0.0	0.0
Removing buildings.....	lump sum \$1,500	\$225	\$1,125	15.0	75.0
Excavation.....	cu. yds. 1,039,800	303,643	305,858	29.2	29.4
Sheeting and bracing.....	ft. B. M. *590,000	295,300	551,300	50.9	95.0
Forming embankment.....	cu. yds. 11,400	1,876	1,876	18.0	18.0
Foundation piles.....	lin. ft. 412,000	272,520	374,131	66.1	90.7
Fender piles.....	No. 110	0	0	0.0	0.0
Sawed lumber.....	ft. B. M. 37,600	0	0	0.0	0.0
Sawed lumber in bridge floor.....	ft. B. M. 43,000	36,100	36,100	84.0	84.0
Stone filling in cribs.....	cu. yds. 110	0	0	0.0	0.0
Second-class concrete.....	cu. yds. 10,945	9,633	9,456	82.5	86.7
Structural steel.....	lbs. 544,700	478,009	478,009	87.8	87.8
Lattice railing.....	lin. ft. 330	278	278	84.3	84.3
Iron castings, plain.....	lbs. 18,000	16,764	16,764	93.0	93.0
Malleable cast-iron nosing.....	lin. ft. 3,300	3,154	3,154	95.7	95.7
Metal reinforcement.....	lbs. 6,350	2,989	5,923	47.1	93.3
Fender fastenings.....	No. 550	0	0	0.0	0.0
Steel sheet-piling.....	sq. ft. 98,000	59,104	90,846	60.3	92.7
Wash wall.....	cu. yds. 500	0	0	0.0	0.0
Third-class riprap.....	cu. yds. 6,750	0	0	0.0	0.0
Taking up and relaying riprap.....	cu. yds. 100	0	0	0.0	0.0
Cobblestone paving.....	sq. yds. 500	0	0	0.0	0.0
Gravel surfacing.....	cu. yds. 17,300	6,870	7,137	39.7	41.7
Drains.....	lin. ft. 7,700	6,531	6,531	84.9	84.9
Wooden fence.....	lin. ft. 11,000	0	0	0.0	0.0
Maintaining highway traffic.....	lump sum \$750	\$150	\$300	20.0	40.0
Coffer-dams, pumping, bailing and draining, lump sum	\$4,500	\$1,350	\$2,250	30.0	50.0
Coffer-dams, pumping, bailing and draining for spillway.....	lump sum \$2,000	\$2,000	\$2,000	100.0	100.0
Loading of test piles.....	lump sum \$929 26	\$929 26	\$929 26	100.0	100.0
Removal of old concrete piles.....	lump sum \$75	\$50	\$50	66.7	66.7
24-inch vitrified pipe.....	lin. ft. 1,100	17	17	1.5	1.5
8-inch vitrified pipe.....	lin. ft. 380	0	0	0.0	0.0
Deduct for sheeting and bracing, reused, ft. B. M. ....		82,100	86,900		
Gross estimate at contract prices.....	*\$591,953 26	\$300,493 88	\$377,882 65	50.8	63.8
<i>Extra Work Orders</i>					
Dec. 13, 1915.....	lump sum \$900 00		\$900 00		Finished
Jan. 10, 1916.....	lump sum 274 50		274 50		Finished
Total.....	\$1,174 50		\$1,174 50		

\*Figures given included an excess quantity authorized by the Canal Board, as follows:  
Sheeting and bracing, 660,000 ft. B. M., by resolution dated May 18, 1916.  
This quantity at the contract price amounts to \$25,200.00.

### Terminal Contract No. 46 — Weedsport

This contract is for constructing a dockwall and approach on the south side of the Seneca river west of the Weedsport bridge.

It was awarded to Scott Bros. of Rome, N. Y., being signed on August 31, 1915. Work began in October, 1915. The engineer's preliminary estimate was \$16,331.00, the contractor's bid, \$13,658.00.

The contract was accepted by the Canal Board June 27, 1917, and the final estimate, amounting to \$11,456.87, was approved on August 8, 1917.

J. G. Palmer, Assistant Engineer, is in charge.

Extra work order dated June 25, 1917, provides for dismantling and moving dredge under highway bridge, for payment for attempting to pull steel sheet-piling in old bridge foundation, and for furnishing right of way to borrow pit.

The material at the site of this dock is very soft and would not support cribs nor masonry. The type of construction adopted was that of wooden piles with timber deck below water-surface and concrete wall and earth fill above water. Fifty- to sixty-foot foundation piles were driven over an area 20 feet wide and extending 150 feet along the shore. These piles were cut off, capped and decked, so as to bring the top of the deck below water-surface. Along the back edge of the deck wooden sheet-piles were driven, the tops being at the elevation of the deck and securely fastened to it. Along the outer edge of the timber deck a gravity section of concrete wall was constructed and a fill made over the deck and extending from the back of the concrete wall to the grade contour on the river bank.

Construction began during October, 1915, and was practically completed at the close of 1916, although some minor things were not finished until this spring.

The dock was constructed as originally planned, without modification. There was considerable delay in obtaining the long foundation piles and also in waiting for extreme low water in the summer of 1916. The timber work could be done at less expense during low water, and as the water was above normal during the early summer months of 1916, construction was not resumed until about the first of August.



BARGE CANAL, TERMINAL CONTRACT NO. 20 — SYRACUSE

View showing the north dockwall just completed, but the channel alongside  
not yet begun.

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MIDDLE DIVISION: ERIE RESIDENCIES NOS. 6 AND 7 237

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	3,100	3,517	8,517	113.5	113.5
Sawed lumber.....ft. B. M.	40,800	36,338	86,338	90.8	90.8
Foundation piles.....lin. ft.	18,900	5,695	14,283	30.1	75.6
Wooden sheet-piling.....ft. B. M.	21,000	22,925	22,925	109.2	109.2
Second-class concrete.....cu. yds.	200	175.8	175.8	87.9	87.9
Third-class riprap.....cu. yds.	135	9.7	9.7	7.2	7.2
Iron castings, plain.....lbs.	1,200	1,160	1,160	96.7	96.7
Malleable cast-iron nosing.....lin. ft.	160	148	148	92.5	92.5
Fender fastenings.....No.	28	25	25	89.3	89.3
Gross estimate at contract prices.....	\$13,658 00	\$8,193 43	\$11,456 87	60.0	83.9
<i>Extra Work Order</i>					
June 25, 1917.....lump sum	\$245 50				

*Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 6 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK			
	Contract No. 20,	Contract No. 28	Contract No. 29	Totals
1916.....	\$77,880	\$15,340	\$950	\$93,670
1917.....	300,500	13,450	2,450	316,400
Totals.....	\$377,880	\$28,790	\$3,400	\$410,070
<i>Extra Work Orders Paid, 1916 and 1917</i>				
1916.....	\$274			\$274
1917.....	900	\$240		1,140
Totals.....	\$1,174	\$240		\$1,414

\* The year 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

The Barge canal terminal work done on section 7 of the Erie canal has all been under terminal contract No. 46. During the nine-month period, ended June 30, 1916, it amounted to \$3,260, and during the twelve-month period, ended June 30, 1917, to \$8,197. No extra work orders have been paid on this section.



*Contract No. 39*

This contract is for dredging a channel in the Oswego river and performing work incidental thereto between Three River Point and Fulton. It extends over a distance of 10.84 miles. The contract was awarded to James Stewart & Co. of New York city, being signed April 15, 1910, and assigned to James Stewart & Co., Inc., on January 9, 1913. Work was started in August, 1910. The engineer's preliminary estimate was \$972,900.00 and the contractor's bid, \$1,048,674.40. The contract price as modified by alterations was \$1,032,561.20.

The contract was accepted by the Canal Board on January 25, 1917, upon condition that the contractor deposit bonds to insure the removal to designated spoil areas of certain spoil material cast up adjacent to the channel. The final account, amounting to \$953,694.90, was approved June 6, 1917.

N. R. McLoud was the engineer in charge.

The contract has been modified by four alterations, all of which are described in last year's report.

Extra work order dated May 22, 1913, provided for removing one span of the old Hinmansville highway bridge to permit the dredging plant to pass and for maintaining highway traffic by ferry until the contract for the new bridge was let.

Extra work order dated October 14, 1915, provided for removing logs, trees and boulders above canal grade, where no excavation was shown in the plans.

Extra work order dated January 13, 1917, provided for repairing city water pipe at Fulton, which was broken during the dredging operations.

Extra work order dated February 2, 1917, provides for removing to spoil-banks certain material cast over in the dredging operations.

The rough excavation was completed in August, 1916, but from two to five dredges were employed until well into November in removing high spots found in the sweeping of the channel and spoil areas. Wash wall north of Phoenix lock was completed on December 31.



BARGE CANAL, CONTRACT NO. 103

Bascule and arch bridge at Phoenix. The State built the bascule over the canal and the three arches next adjacent. The counties and towns connected by the bridge built the six other arches over the river.

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Rock spoil which the contractor had been permitted to cast over adjacent to the prism slopes between Stas. 243 and 255 was removed under an extra work order dated February 2, 1917, during the months of April and May, 1917, at a total cost of \$10,217.30.

In addition final accounts for two extra work orders dated October 14, 1915, and January 13, 1917, on a force account basis, have not been rendered.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent. final estimate of contract quantities
Clearing..... lump sum	\$150	\$150	\$150	100.0	103.0
Excavation..... cu. yds.	1,220.460	37,495	1,141.878	3.1	93.6
Sheeting and bracing..... ft. B. M.	5,000	0	0	0.0	0.0
Round timber bracing..... lin. ft.	500	0	0	0.0	0.0
Wooden sheet-piling..... ft. B. M.	5,000	0	0	0.0	0.0
Second-class concrete..... cu. yds.	144	80	80	55.6	55.6
Wash wall..... cu. yds.	6,372	2,032.8	2,032.8	32.4	32.4
Second-class riprap..... cu. yds.	250	0	0	0.0	0.0
Third-class riprap..... cu. yds.	250	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	314	0	0	0.0	0.0
Iron castings, plain..... lbs.	6,000	3,780	3,780	63.0	63.0
Gross estimate at contract prices.....	\$1,032,561 20	\$37,064 90	\$1033,694 90	3.6	92.4
<i>Extra Work Orders</i>					
May 22, 1913..... cost plus 15 per cent			\$5,830 91		Finished
Oct. 14, 1915..... cost plus 15 per cent					
Jan. 13, 1917..... cost plus 15 per cent					
Feb. 2, 1917..... contract unit price	\$9,130 00		10,217 30		Finished
Total.....			\$16,103 21		

### Contract No. 103

This contract is for the construction of a bascule bridge over the Oswego canal and three arches of a nine-arch reinforced bridge over the Oswego river at Lock street, Phoenix. It was awarded to Barrally & Ingersoll of Rochester, N. Y., being signed on December 10, 1912. The engineer's preliminary estimate was \$185,655.00, the contractor's bid, \$197,995.00. The contract price as modified by alterations Nos. 1, 2, 3 and 4 is \$205,744.75.

The contract was accepted by the Canal Board on January 4, 1917, and final payment, amounting to \$182,825.38, approved on March 1, 1917.

J. E. Smith, Engineer in charge.

The bridge consists of a double-leaf, 140-ft. clear span, bascule lift-bridge over the canal and three 57½-ft.-span reinforced concrete arches, which, in connection with six similar arches built by the counties, bridge the Oswego river. The arch portion of the bridge was authorized by chapter 792, Laws of 1911.

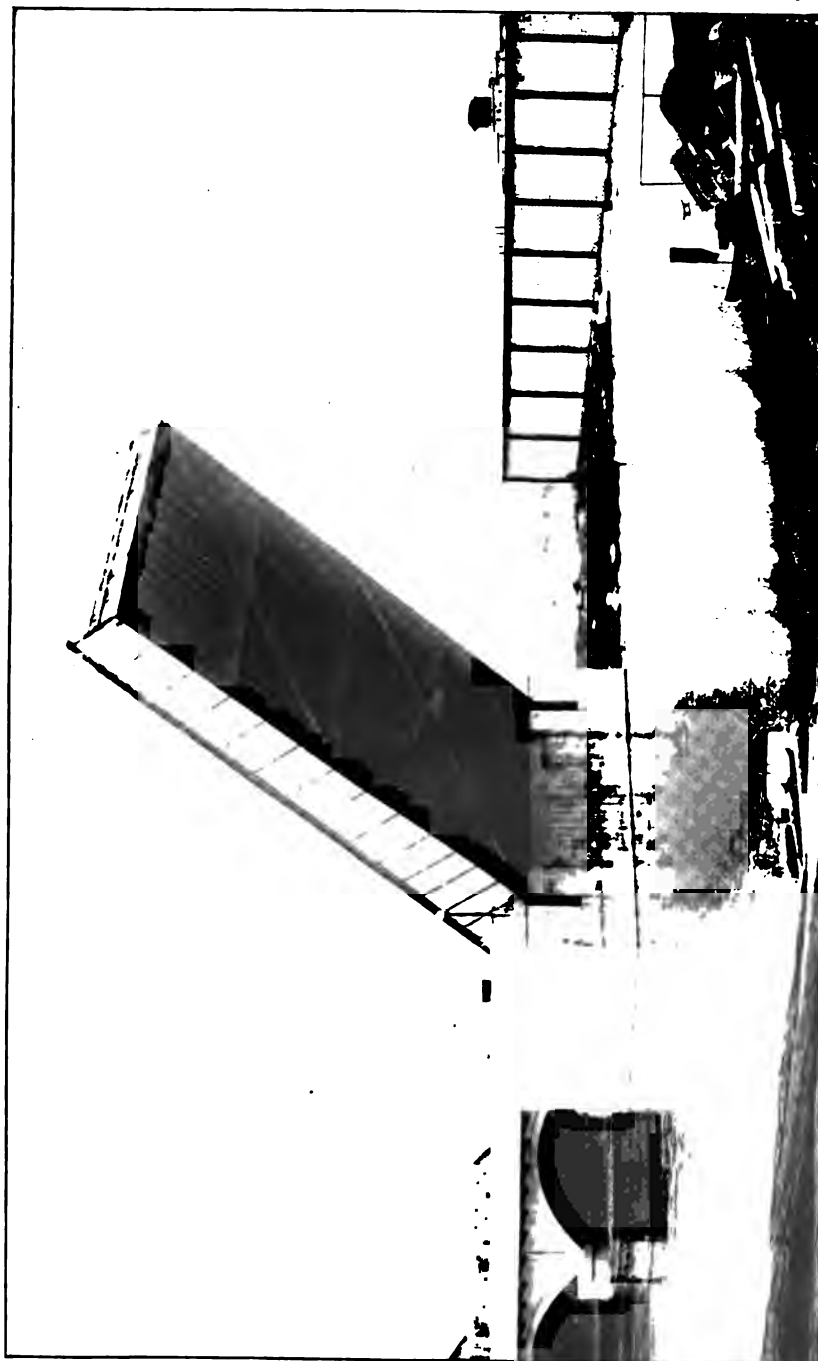
Previous to June 30, 1916, the contract had been modified by three alterations, which made an aggregate increase of \$8,343.75 in the amount of the contract price.

Alteration No. 4, approved by the Canal Board November 22, 1916, provided for eliminating all remaining excavation and decreased the contract price by \$594.00.

The construction to be done under the contract, exclusive of that eliminated under alteration No. 4, had been completed during the fiscal year ended June 30, 1916.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
<i>Chapter 147, Laws of 1903, and Amendatory Laws</i>					
Coffer-dams, pumping, bailing and draining, lump sum	\$7,000	0	\$7,000	0.0	100.0
Excavation.....cu. yds.	16,904	258	7,525	1.5	44.5
Forming embankment.....cu. yds.	650	7	176	1.1	27.1
Second-class concrete.....cu. yds.	1,730	0	1,701.6	0.0	98.4
First-class reinforced concrete.....cu. yds.	271	0	171.2	0.0	63.1
Second-class reinforced concrete.....cu. yds.	1,430	49.9	1,414.9	3.5	98.9
Structural steel.....lbs.	1,059,000	8,039	998,030	0.3	94.3
Metal reinforcement.....lbs.	96,850	2,268	85,029	2.4	87.8
Machinery.....lbs.	105,000	945	102,498	0.9	97.6
Brick pavement.....sq. yds.	320	6	318	1.9	99.4
Wood-block pavement.....sq. yds.	390	3	370	0.8	94.9
Sawed lumber.....ft. B. M.	4,000	827	3,827	20.7	95.7
Crescoted lumber.....ft. B. M.	19,000	500	18,500	2.6	97.4
Fiber duct.....lin. ft.	4,400	69	1,909	1.6	43.4
Metal duct.....lbs.	2,960	1,824	2,960	61.6	100.0
Timber crib.....lump sum	\$800	0	\$800	0.0	100.0
Electrical equipment.....lump sum	\$12,500	0	\$12,500	0.0	100.0
Doors, windows, woodwork, hardware, roofing, painting and plumbing for operator's house, lump sum	\$1,200	0	\$1,200	0.0	100.0
Maintenance accessories.....lump sum	\$200	\$100	\$200	50.0	100.0
Maintaining navigation.....lump sum	\$1,000	0	\$1,000	0.0	100.0
Maintenance of highway traffic.....lump sum	\$500	0	\$500	0.0	100.0
Wrought-iron pipe railing.....lin. ft.	76	0	76	0.0	100.0





ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Deduct for bridge superstructure..... lump sum	\$100	0	\$100	0.0	100.0
Sheeting and bracing..... ft. B. M.	17,000	739	16,739	4.3	98.5
Armor for cable..... lump sum	\$500	0	\$500	0.0	0.0
Metal housing for pump motor..... lump sum	\$150	0	\$150	0.0	100.0
Drilling 3-in. holes..... lin. ft.	50	9	12	18.0	24.0
Chipping concrete..... cu. ft.	50	1	47	0.2	94.0
Additional coffer-dams, pumping, bailing and draining..... lump sum	\$6,600	0	\$6,600	0.0	100.0
Part estimate at contract prices.....	*\$179,463 75	\$1,684 15	\$158,238 79	0.9	88.2
<i>Chapter 792, Laws of 1911</i>					
Coffer-dams, pumping, bailing and draining, lump sum	\$4,750	0	\$4,750	0.0	100.0
Excavation..... cu. yds.	100	0	93	0.0	93.0
Second-class concrete..... cu. yds.	470	0.4	381.4	0.1	81.2
First-class reinforced concrete..... cu. yds.	630	5	580	0.8	92.0
Structural steel..... lbs.	72,000	0	71,692	0.0	99.6
Metal reinforcement..... lbs.	64,000	2,418	56,684	3.8	88.6
Brick pavement..... sq. yds.	540	0	507	0.0	93.9
Balustrade..... lin. ft.	400	0	384	0.0	96.0
Rigid metal duct..... lbs.	1,500	0	1,409	0.0	93.9
Part estimate at contract prices.....	\$26,455 00	\$121 23	24,586 59	0.5	92.9
<i>Summary of Estimates</i>					
Chapter 147, Laws of 1903, etc., total.....	*\$179,463 75	\$1,684 15	\$158,238 79	0.9	88.2
Chapter 792, Laws of 1911, total.....	26,455 00	121 23	24,586 59	0.5	92.9
Gross estimate at contract prices.....	*\$205,918 75	\$1,805 38	\$182,825 38	0.9	88.8
<i>Extra Work Orders</i>					
Aug. 18, 1913..... cost plus 15 per cent	\$350 00		\$427 21		Finished
June 4, 1914..... cost plus 15 per cent			500 43		Finished
July 2, 1914..... special unit price	375 00		375 00		Finished
Nov. 6, 1914..... special unit price	840 00		840 00		Finished
Dec. 3, 1914..... cost plus 15 per cent			65 54		Finished
Total.....			\$2,208 23		

\* Figures given include an excess quantity authorized by the Canal Board, as follows:

Metal duct, 1,160 lbs., by resolution dated Mar. 1, 1917.

This quantity at the contract price amounts to \$174.00.

### Contract No. 99

This contract is for constructing portions of a bridge over the Oswego river at Minetto. A steel span over the Barge canal channel is to be paid for from Barge canal funds and a 70-foot reinforced concrete arch west of the Barge canal channel and the west approach are to be paid for under chapter 716, Laws of 1915, which made a special appropriation of \$50,000. It was awarded to Larkin and Sangster of Buffalo, N. Y., being signed on September 12, 1916. The engineer's preliminary estimate was \$117,170.75 — \$73,082.60 for the steel span and \$44,088.15 for



the arch and approach — and the contractor's bid, \$115,980.75 — \$72,992.60 for the steel span and \$42,988.15 for the arch and approach.

E. M. Ellis, Assistant Engineer, is in charge.

An extra work order dated November 28, 1916, provided for repairing a private intake water-pipe near the southerly end of a retaining wall along the west bank of the river, this pipe having been damaged during construction under contract No. 37. This work has been performed at a cost of \$738.53.

The steel span is so designed that it may be converted into a single-leaf bascule lift-bridge with a clear opening of 135 feet.

Three reinforced concrete arches, having spans of about 90, 100, and 110 feet, are being built by the towns of Volney and Oswego to complete the bridge across the Oswego river.

Larkin & Sangster are also the contractors for the portion of the bridge being built by the towns, and so the plant was on the ground and construction was commenced in September, soon after signing the contract.

The contracts are being carried on simultaneously. The town end of the bridge had been under contract several months before the State portion was awarded and is now nearly complete. There has been considerable delay from scarcity of labor, but with the completion of the town contract there is hope for better progress.

In order to obviate the necessity of raising the west river road, which is the main street through the village of Minetto, a retaining wall was provided along the east side of the road and the bridge approaches constructed between that and the river. The length of this approach from the north is limited, making necessary a grade of nearly 8 per cent. The approach from the south is much flatter, being less than 6 per cent.

The retaining wall has been completed to the under line of the coping and the greater portion of the approach fill has been placed. The westerly abutment has been constructed to the springing line of the arch and a crib coffer-dam has been framed and placed, to surround the bascule pit and adjacent arch, so that these structures may be built in the dry.



BARGE CANAL, CONTRACT NO. 99

Bridge over the Barge canal and Oswego river at Minetto. The towns connected built the three arches shown; the State built the remainder. Next to the left is a fixed steel span, convertible to a bascule; then the counterweight pit and one concrete arch.



The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Chapter 147, Laws of 1903, and Amendatory Laws</i>			
Excavation.....	cu. yds. 1,140	150	13.2
Sawed lumber, craned.....	ft. B. M. 24,600	0	0.0
Sawed lumber, plain.....	ft. B. M. 6,720	0	0.0
First-class reinforced concrete.....	cu. yds. 32	0	0.0
Second-class reinforced concrete.....	cu. yds. 2,500	0	0.0
Structural steel.....	lbs. 441,000	0	0.0
Metal reinforcement.....	lbs. 124,000	0	0.0
Concrete balustrade.....	lin. ft. 130	0	0.0
Wood-block pavement.....	sq. yds. 450	0	0.0
Metal duct.....	lbs. 1,620	0	0.0
Lattice railing.....	lin. ft. 300	0	0.0
Channel lamps.....	No. 6	0	0.0
Maintaining navigation.....	lump sum \$300	0	0.0
Coffer-dams, pumping, bailing and draining.....	lump sum \$3,500	0	0.0
Part estimate at contract prices.....	\$72,992 60	\$330 00	0.5
<i>Chapter 716, Laws of 1916</i>			
Excavation.....	cu. yds. 6,240	3,132	50.2
Forming embankment.....	cu. yds. 4,170	1,800	43.2
Second-class concrete.....	cu. yds. 2,700	1,785	66.1
First-class reinforced concrete.....	cu. yds. 240	0	0.0
Structural steel.....	lbs. 24,800	0	0.0
Metal reinforcement.....	lbs. 7,800	0	0.0
Triple-lap sheet-piling.....	ft. B. M. 2,940	0	0.0
Sheeting and bracing.....	ft. B. M. 39,600	0	0.0
Cobblestone gutter.....	sq. yds. 166	0	0.0
Concrete sidewalk.....	sq. ft. 2,700	0	0.0
Concrete edging.....	lin. ft. 100	0	0.0
Concrete curb.....	lin. ft. 890	0	0.0
Stone header.....	lin. ft. 103	0	0.0
Concrete balustrade.....	lin. ft. 1,025	0	0.0
Brick pavement.....	sq. yds. 1,540	0	0.0
Catch-basins.....	No. 6	0	0.0
Waterproofing, two layers.....	sq. yds. 215	0	0.0
Waterproofing, one layer.....	sq. yds. 53	0	0.0
Vitrified clay conduits.....	lin. ft. 635	0	0.0
Metal duct.....	lbs. 2,000	0	0.0
Coffer-dams, pumping, bailing and draining.....	lump sum \$900	\$810	90.0
Part estimate at contract prices.....	\$42,989 15	\$16,080 60	37.4
<i>Summary of Estimates</i>			
Chapter 147, Laws of 1903, etc., total.....	\$72,992 60	\$330 00	0.5
Chapter 716, Laws of 1916, total.....	42,989 15	16,080 60	37.4
Gross estimate at contract prices.....	\$115,980 75	\$16,410 60	14.1
<i>Extra Work Order</i>			
Nov. 29, 1916.....	cost plus 15 per cent		

### Contract No. 139

This contract is for excavating a channel in the Oswego river from the lower end of lock No. 8, at Oswego, to deep water. It was awarded to H. S. Kerbaugh, Inc., of Buffalo, N. Y., being signed on November 3, 1916. Work began October 29, 1916. The engineer's preliminary estimate was \$25,280.00, the contractor's bid, \$25,912.00.

The length of the contract is approximately 1,000 feet, all within the limits of the Oswego harbor. Its completion makes possible the entering of the canal from Lake Ontario by boats with maximum canal draft.

George H. Haley, Assistant Engineer, is in charge.

A drill-boat was operated until January 13, when work was suspended, to be resumed again on April 6. The excavation had progressed sufficiently to furnish a channel 8 feet deep, upon the opening of navigation on May 15. A coffer-dam built in connection with construction under terminal contract No. 30 is located within the limits of contract No. 139, and the excavation as contemplated by the latter contract cannot be completed until the coffer-dam is removed. Such excavation as can be done without disturbing the coffer-dam has been completed, making a 12-foot channel with a minimum width of 105 feet. The channel is yet to be swept and such obstructions as are found are to be removed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	15,800	10,446	66.1
Gross estimate at contract prices.....	\$25,912 00	\$17,131 44	66.1

#### *Contract No. 153*

This contract is for furnishing and delivering oil-burning lanterns for buoys, stake and bridge lights on the Mohawk, Oneida, Seneca and Oswego rivers. It was awarded to R. B. Wing & Son, Albany, N. Y., being signed on February 28, 1917. The engineer's preliminary estimate was \$12.00 per lantern, or \$2,088.00 for the part on this residency, the contractor's bid, \$12.54 per lantern, or \$2,181.96.



BARGE CANAL, TERMINAL CONTRACT NO. 30 — OSWEGO  
(General view of the Oswego (river) terminal site at the beginning of construction. The hydraulic canal, which has to be crossed to reach the terminal, is seen at the right.)

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*Construction Work — Barge Canal*

The Barge canal work done on the Oswego canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE							
	Contract No. 10	Contract No. 10-A	Contract No. 10-B	Contract No. 10-C	Contract No. 33 (Oswego)	Contract No. 35	Contract No. 37	Contract No. 37-R
1903.....	\$2,220							
1907.....	69,010							
1908.....	125,110					\$47,920		
1909.....	181,000					161,490		
1910.....	249,460					94,080		
1911.....	61,660				\$24,890	130,320	\$607,840	
1912.....		\$88,800	\$76,240		71	207,440	530,080	
1913.....		70,200	389,380			26,810	695,930	\$3,659
1914.....		7,372	55,050			4,289	541,803	
1915.....			2,326	\$36,780			210,070	
1916.....				3,124			16,059	
1917.....								
Totals....	\$664,300	\$166,172	\$521,036	\$39,904	\$24,961	\$872,349	\$2,606,789	\$3,659

<i>Extra Work Orders Paid, 1906-1917, Inclusive</i>								
1908.....	\$1,198							
1909.....						\$761		
1911.....	821					150		
1912.....		\$35			\$302			
1913.....		1,710				2,463		
1914.....		666	\$7,803			274	\$633	\$23
1915.....						104	1,992	
1916.....							263	
1917.....								
Totals....	\$2,019	\$2,411	\$7,803		\$302	\$3,752	\$2,391	\$23

YEAR*	VALUE OF WORK DONE							
	Contract No. 30	Contract No. 33	Contract No. 74	Contract No. 79	Contract No. 80	Contract No. 85	Contract No. 90 (Oswego)	Contract No. 90-A
1903.....								
1907.....								
1908.....								
1909.....		\$1,570						
1910.....	\$26,430	135,090	\$23,560	\$70			\$130	
1911.....	104,170	27,013	22,830	20,880	\$53,030	\$500	22,321	
1912.....	100,120		3,704	13,030	53,670	11,510	28,210	\$049
1913.....	159,400				1,145	85	1,745	21,10
1914.....	247,400							32,930
1915.....	131,490							7,524
1916.....	147,620							
1917.....	37,065							
Totals....	\$953,693	\$164,576	\$50,098	\$33,980	\$110,896	\$12,098	\$52,795	\$62,94

<i>Extra Work Orders Paid, 1906-1917, Inclusive</i>								
1908.....								
1909.....								
1911.....		\$1,113	\$51					
1912.....				\$691	\$200		\$476	
1913.....					939	\$241	3,032	
1914.....	\$5,891							
1915.....								\$255
1916.....								
1917.....	10,217							
Totals....	\$16,103	\$1,113	\$51	\$691	\$1,148	\$241	\$3,538	\$253



YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 83 (Oswego)	Contract No. 90 †	Contract No. 100 (Oswego)	Contract No. 103	Contract No. 104	Contract No. 139	
1906.....							\$2,220
1907.....							69,010
1908.....							173,030
1909.....							224,060
1910.....							529,890
1911.....							1,075,656
1912.....							1,117,259
1913.....				\$20,610	\$3,600		1,427,058
1914.....	\$21,060		\$19,040	123,030	2,666		1,059,637
1915.....	98,200		39,705	26,830			552,925
1916.....	513			10,540			177,856
1917.....		\$330		1,815		\$17,130	56,340
Totals.....	\$119,773	\$330	\$58,745	\$182,825	\$36,856	\$17,130	\$6,564,841

Extra Work Orders Paid, 1908-1917, Inclusive							
1908.....							\$1,198
1909.....							761
1911.....							2,135
1912.....							1,703
1913.....							8,415
1914.....				\$427			15,719
1915.....				1,781			4,130
1916.....			\$10				276
1917.....							10,217
Totals.....			\$10	\$2,208			\$44,554

\* The years 1906 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

† Figures given do not include work to the value of \$16,080 done under Chap. 716, Laws of 1915, which appropriated \$50,000 for a portion of the work being done under this contract.

NOTE.—No extra work orders were paid on this canal during 1903, 1907 and 1910.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 33, section 1, Erie canal, and section 3, Champlain; contract No. 90, section 6, Erie and section 3 Champlain; contract No. 93, sections 5, 6 and 7, Erie; contract No. 100, section 6, Erie; contract No. 153, sections 4 and 6, Erie.

### *Terminal Contract No. 30 — Oswego, River Terminal*

This contract is for constructing a dockwall, an approach to the terminal and appertaining structures on the east side of the Oswego river between Schuyler and Cayuga streets, Oswego. It was awarded to Henry P. Burgard of Buffalo, N. Y., being signed on March 24, 1916. Work was begun in April, 1916. The engineer's preliminary estimate was \$103,700.00, the contractor's bid, \$90,984.00. The contract price as modified by alterations Nos. 1 and 2 is \$106,583.10.

George H. Haley, Assistant Engineer, is in charge.

The contract has been modified by the following alterations:

Alteration No. 1, approved by the Canal Board August 3, 1916, provides for eliminating the dockwall and terminal north of East Seneca street and for removing and rebuilding the westerly wall



**BARGE CANAL, TERMINAL CONTRACT NO. 30 — OSWEGO**  
**Approach to the Oswego (river) terminal. A view from near the end of the bridge over the hydraulic canal. The terminal area lies along the left side of this approach.**

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of the hydraulic canal. It increases the amount of the contract price by \$15,821.40.

Alteration No. 2, approved by the Canal Board May 23, 1917, provides for eliminating portions of the roadway retaining wall, for constructing an approach to an existing building at the south end of the terminal site, for eliminating the items of stone and tile drains, for changing the hydraulic canal wall, and for constructing a fence at the end of East Seneca street. It decreases the amount of the contract price by \$222.30.

Extra work order dated March 1, 1918, provides for certain changes in culvert entrance, for removing and resetting the gate at northerly end of hydraulic canal, and for removing and later rebuilding an old bridge belonging to the city of Oswego.

Construction was commenced during the early part of April, 1916. A coffer-dam was built, enclosing 85 per cent of the length of the dockwall site and a strip 10 feet wide of adjacent harbor excavation. Inside this coffer-dam the excavation has been completed and dockwall constructed. About 90 per cent of the fill back of the completed wall is in place.

The construction of the hydraulic canal wall as provided under alterations Nos. 1 and 2 is now under way. The canal has been unwatered, the old wall along the west side from Cayuga to Schuyler streets removed and about 45 per cent of the new wall constructed. At the southerly end, where connection is made with the existing wall, the foundation excavation could not be carried to rock without reconstructing the coffer-dam. A steel sheet-pile was placed in the end of the most southerly section of the wall, which was founded on rock, and interlocking steel piles were driven to close the gap between the end of this wall and the existing canal wall on the southerly side of Cayuga street. These piles were cut off and embankment formed back of them. A concrete wall extending below the water-surface of the canal was built on the embankment and in such a location as to encase the tops of the piles.

The westerly abutment for the bridge which is to carry traffic over the hydraulic canal on Cayuga street to the terminal has been built, but as yet nothing has been done toward the construction of the easterly abutment or superstructure, which I understand is to be built by the city of Oswego.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$100	0	\$100	0.0	100.0
Excavation..... cu. yds.	28,100	10,815	16,150	38.8	57.5
Sheeting and bracing..... ft. B. M.	77,000	70,500	70,500	91.6	91.6
Embankment..... cu. yds.	10,420	0	0	0.0	0.0
Sawed lumber..... ft. B. M.	7,500	0	0	0.0	0.0
Stone filling..... cu. yds.	2,550	0	0	0.0	0.0
Wooden fence..... lin. ft.	295	0	0	0.0	0.0
Second-class concrete..... cu. yds.	8,500	6,015	6,015	70.8	70.8
First-class reinforced concrete..... cu. yds.	184	148	148	80.4	80.4
Structural steel..... lbs.	1,570	405	405	25.9	25.9
Iron castings, plain..... lbs.	6,500	5,157	5,157	79.3	79.3
Malleable cast-iron nosing..... lin. ft.	590	509	509	86.3	86.3
Metal reinforcement..... lbs.	24,285	20,384	20,384	83.9	83.9
Fender fastenings..... No.	83	79	79	84.9	84.9
Wrought-iron pipe railing..... lin. ft.	25	0	0	0.0	0.0
Metal curb protection..... lin. ft.	524	428	428	81.7	81.7
Broken stone or gravel surfacing..... cu. yds.	1,210	0	0	0.0	0.0
Cobblestone paving..... sq. yds.	300	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining (alteration No. 1)..... lump sum	\$18,000	\$12,256	\$12,256	68.1	79.2
Pipe hand-railing..... lin. ft.	600	490	490	81.7	81.7
Deduct for sheeting and bracing, reused, ft. B. M.		24,400	24,400		
Gross estimate at contract prices.....	\$103,533 10	\$66,940 59	\$71,708 09	62.8	67.3
<i>Extra Work Order</i>					
Nov. 14, 1916..... lump sum	\$950		\$855		

† Work to the value of \$2,000 was done prior to July 1, 1916, under the original contract item, coffer-dams, pumping, bailing and draining, which item was eliminated by alteration No. 1, approved by the Canal Board August 3 1916. This work was used under the above new item and its value is therefore deducted from the total work done to date to show the work done during year.

### *Terminal Contract No. 33 — Oswego, Lake Terminal*

This contract is for constructing a terminal pier, excavating channels, removing a portion of the U. S. breakwater, etc., at the foot of West First street, Oswego. It was awarded to H. S. Kerbaugh, Inc., of New York city, being signed on July 10, 1914. Work began August 15, 1914. The engineer's preliminary estimate was \$415,420.00, the contractor's bid, \$348,684.50. The contract price as modified by alteration No. 1 is \$351,175.50.

George H. Haley, Assistant Engineer, is in charge.

The terminal consists of a pier one hundred and fifty feet wide extending one thousand feet northerly into the Oswego harbor on Lake Ontario. The outer line of the pier is stone-filled timber cribs below the water-surface with a concrete wall above water. The area back of the cribs and wall is filled with stone and earth.

The only modification of the contract is the addition of timbers to the top of the cribs for supporting the concrete wall. These



BARGE CANAL, CONTRACT NO. 85

Bascule bridge with balance beam and overhead counterweight, over the lock at Phoenix. Since the lock had already been built, this special type of bridge was necessary.



timbers were provided under alteration No. 1, which increased the contract price by \$2,491.00.

Work was begun August 15, 1914, but very little more than assembling of plant and materials was accomplished before winter set in and work was suspended. The excavation of foundation for the cribs and adjacent channel was resumed in April, 1915, and continued during the summers of 1915 and 1916, the last crib being sunk in place on September 28, 1916, and the concrete completed during the following month.

The excavating plant consists of a  $4\frac{1}{2}$ -cu. yd. dipper-dredge, dump-scows, tugs and derrick-boats. This type of plant made necessary the rehandling of all spoil placed in the dock fill.

In order to progress the channel excavation as rapidly as possible with the plant available, the contractor wasted material in Lake Ontario which could have been placed in the pier. This made necessary the borrowing of material from without the contract bounds to complete the pier fill. The fill at the extreme southerly end of the pier and in the approach could not be reached with the floating plant and was made largely from ashes, cinders, and waste materials out of cellar and foundation excavations in adjacent sections of the city.

The cribs are constructed of squared timbers laid close on the front face, and the ends of the cribs are butted as close as possible. Even with this construction the surge of heavy seas at the exposed northeast corner has caused considerable settlement in the fill and made necessary the refilling of several large holes this season. The contract is now nearly complete, except some filling at the southerly end of the pier and in the approach.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	195,000	51,418	185,654	26.4	95.2
Ballast.....cu. yds.	3,300	193	193	5.8	5.8
Sawed lumber.....ft. B. M.	2,757,000	298,600	2,729,300	10.8	99.0
Stone filling.....cu. yds.	30,000	4,414	29,150	14.7	97.2
50-ft. fender piles.....No.	36	30	30	83.3	83.3
Block concrete.....cu. yds.	1,560	819	1,544	52.5	99.0
Second-class concrete.....cu. yds.	2,600	1,351	2,075	52.0	79.8
Structural steel.....lbs.	495,000	46,887	520,164	9.5	105.1
Malleable cast-iron nosing.....lin. ft.	2,500	1,509	2,319	60.4	92.8
Fender fastenings.....No.	1,240	332	602	26.8	48.5
Iron castings, plain.....lbs.	12,200	8,080	12,120	66.2	99.3
Removing portion of pile dock, lump sum	\$1,500	0	\$1,500	0.0	100.0
Gross estimate at contract prices.....	\$351,175 50	\$88,806 03	\$332,949 98	25.3	94.8



*Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on the Oswego canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE		
	Contract No. 30	Contract No. 33	Totals
1914.....		\$1,520	\$1,520
1915.....		139,170	139,170
1916.....	\$4,760	103,450	108,210
1917.....	66,940	88,800	155,740
Totals.....	\$71,700	\$332,940	\$404,640
<i>Extra Work Orders Paid, 1914-1917, Inclusive</i>			
1917.....	\$855	.....	\$855
Totals.....	\$855	.....	\$855

\* The years 1914 and 1915 are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.  
 NOTE.—No extra work orders were paid during 1914, 1915 and 1916.

## CAYUGA AND SENECA CANAL RESIDENCY

Senior Assistant Engineer H. C. Smith reports:

*Contract B*

This contract provided for excavating a channel mainly in the Seneca river from Montezuma to deep water in Cayuga lake, from Cayuga lake to Seneca Falls and from Waterloo to deep water in Seneca lake. Length, 17.2 miles. It was awarded to Crowell-Sherman-Stalter Co., now Sherman-Stalter Co., on December 29, 1910. Work was started January 13, 1911. The engineer's preliminary estimate was \$1,832,550.00, the contractor's bid, \$1,448,550.00. The contract price as modified by alterations Nos. 1, 2, 3, 4, 6 and 7 was \$1,388,434.50.

This contract was accepted by the Canal Board March 1, 1917, and the final account, amounting to \$1,303,762.79, approved May 23, 1917.

H. N. Metzger, Assistant Engineer, was in charge.



CONCRETE ARCH BRIDGE AT BROADWAY, FULTON

This bridge has been completed and in use for several years. The State paid for only one arch — the most distant one in the view, the one which spans the canal channel. The foot of lock No. 2 is seen at this arch.

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During the year work was done on the portion of the canal covered by alteration No. 3. This alteration provided for changing the location of the canal from Sta. 6455 + 95 to Sta. 6497 + 27 and from Sta. 6587 + 26 to Sta. 6612 + 69. This change was necessary because the canal was quite close to the Lehigh Valley R. R. and it was feared that the bank would slide and endanger the railroad track. This alteration increased the amount of the contract price by \$1,113.00.

The dipper-dredge cleaned up the prism between Waterloo and Seneca lake, casting spoil upon the bank at points where the volume was small, the remainder being carried in scows partly to deep water in Seneca lake and partly to the basin at Seneca Falls. The temporary bridge at Lake road was placed on pontoons and moved out of and into place to permit the passage of the scows. The clam-shell scow assisted in cleaning up the prism. The masonry of the east wall of the old guard-lock at the foot of Seneca lake was broken with the aid of a drill-boat and dynamite.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent. final estimate of contract quantities
Clearing..... lump sum	\$1,500	0	\$1,500	0.0	100.0
Excavation..... cu. yds.	6,332,450	13,045	5,989,699	0.2	94.6
Excavating old masonry..... cu. yds.	1,250	1,356	1,356	108.5	108.5
Forming embankment..... cu. yds.	1,000	0	0	0.0	0.0
Wash wall..... cu. yds.	1,000	0	0	0.0	0.0
Second-class riprap..... cu. yds.	2,300	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	1,150	0	0	0.0	0.0
Maintaining highway traffic..... lump sum	\$2,500	0	\$2,500	0.0	100.0
Maintaining navigation..... seasons	2	0 29	2	0.1	100.0
Deduct for metal in guard-gates..... lump sum	\$100	\$57 14	\$100	57.1	100.0
Maintaining navigation on alteration No. 7..... season	1	1	1	100.0	100.0
Gross estimate at contract prices.....	\$1,398,434 50	\$19,058 31	\$1,303,762 79	1.4	93.9
<i>Extra Work Orders</i>					
Sept. 10, 1913..... cost plus 15 per cent			\$7,706 46	.....	Finished
Jan. 29, 1915..... lump sum	\$1,700 00		1,700 00	.....	Finished
Total.....			\$9,406 46	.....	.....

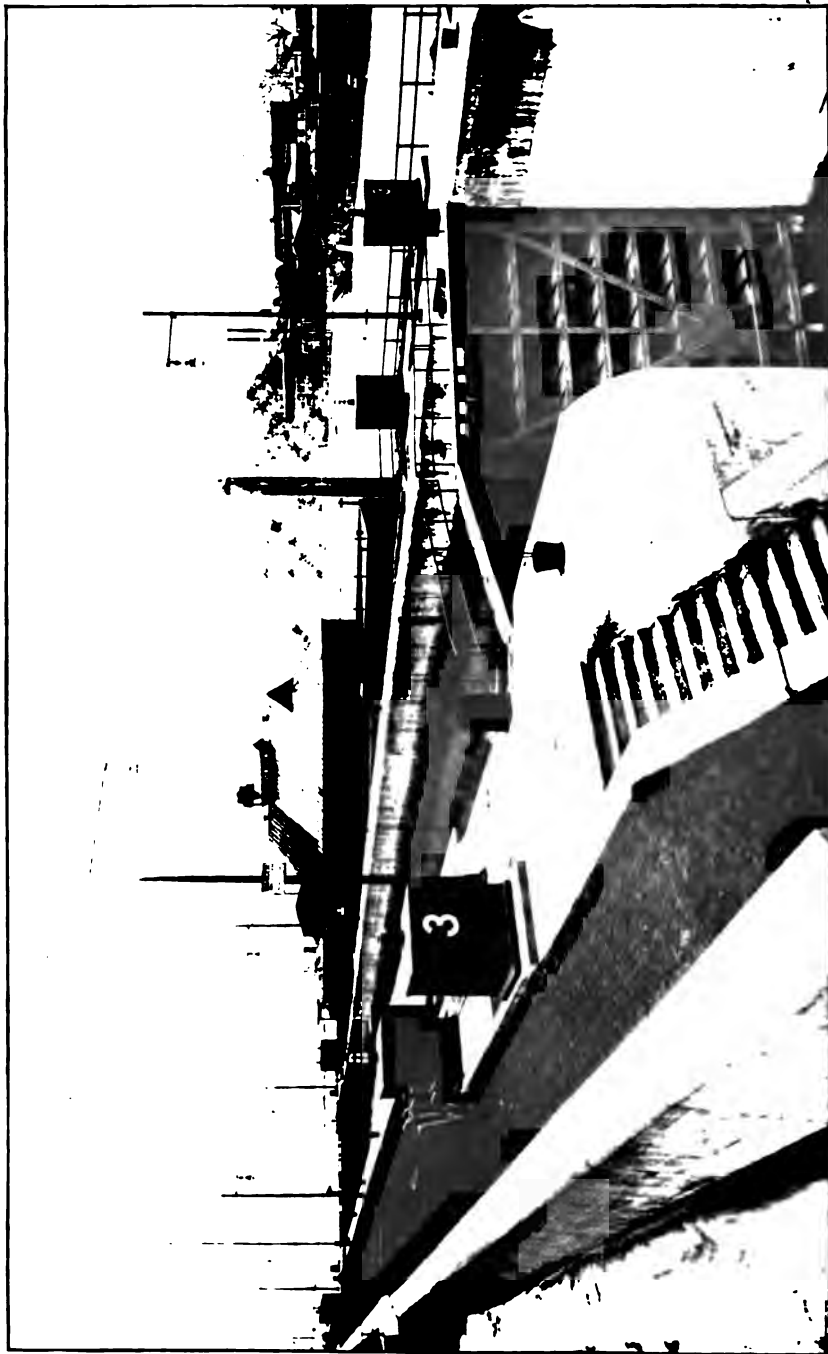
*Contract F*

This contract provides for constructing the substructures, superstructures and approaches of the three following highway bridges: Free bridge, Sta. 5640, three miles north of Cayuga; Demont's bridge, Sta. 6080, three miles east of Seneca Falls; Lake road bridge, Sta. 6688, near entrance to Seneca lake. It was awarded to the Stanley Construction Co., being signed on July 20, 1914. Work was started on March 19, 1915. The engineer's preliminary estimate was \$126,263, the contractor's bid, \$119,913.00. The contract price as modified by alterations Nos. 1 and 2 is \$142,578.70.

L. L. Hadley, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Board November 10, 1914, provides for changing the line and grade of the south approach to Lake road bridge and for substituting gravel lining for bituminous macadam. The changes of line and grade were made because the State Highway Commission changed its plans for the Lehigh Valley R. R. crossing from an underground to a grade-crossing. Gravel lining was substituted for bituminous macadam because, as the approaches are of considerable depth, the surfacing would settle with the approaches. Therefore it was deemed advisable to wait till some future time, after the approaches have had a chance to settle, before placing the bituminous macadam, and to place gravel lining in its place. This alteration increases the amount of the contract price by \$3,165.00.

Alteration No. 2, approved by the Canal Board January 5, 1916, provides for changing the foundations for the abutments and piers at Free bridge. Owing to the unstable nature of the foundation, a row of sheet-piling was placed around the footing course of each structure and made a part of the foundation. The plans for the east abutment were materially changed by substituting two columns for the original wing-wall abutment and placing riprap on the embankment, which is subject to erosion by the river channel. This alteration increases the amount of the contract price by \$19,500.70.



BARGE CANAL, CONTRACT NO. 10-B

Completed lock No. 3, Oswego canal—the lower lock at Fulton. Because of the volume and variety of construction within a small compass, the proximity of the river, the number of adjacent power and industrial plants and the many other complications, the work at Fulton presented numerous interesting engineering problems.

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During the year the following construction work has been done:

At Free bridge work was done on the east approach, including some wooden fence on one side. The east pier was completed, the west pier and west abutment built and the west approach filled, except for the grading of the top. The steel for the superstructure was erected and the floor forms for the approach spans built and the reinforcement placed.

At Demont's bridge no work was done.

At Lake road bridge the south abutment was completed, riprap placed around both abutments and on the lake side of the south approach fill and the north approach fill completed, except for trimming. Some work was done on the south approach fill. Nearly all the lining was placed on the north approach and also some on the south approach. The wooden fence on the north approach was about three-fourths completed. The steel superstructure was erected, floor forms built and steel reinforcement placed.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	49,080	11,764	38,719	24.0	78.8
Lining.....cu. yds.	612	118	361	19.3	59.0
Sawed lumber.....ft. B. M.	500	0	0	0.0	0.0
Foundation piles.....lin. ft.	20,036	6,074	17,776	30.3	88.7
Second-class concrete.....cu. yds.	5,844	2,110	5,395	36.1	92.3
First-class reinforced concrete.....cu. yds.	330	0	63	0.0	19.1
Third-class riprap.....cu. yds.	1,563	848	848	54.2	54.2
Structural steel.....lbs.	745,000	556,750	720,550	74.7	96.7
Metal reinforcement.....lbs.	78,680	1,807	23,555	2.3	29.9
Bituminous surfacing.....sq. yds.	1,000	223	223	22.3	22.3
Wooden fence.....lin. ft.	2,670	578	1,234	21.6	46.2
Wrought-iron pipe railing.....lin. ft.	50	0	0	0.0	0.0
Lattice railing.....lin. ft.	160	155.7	155.7	97.4	97.4
Oil signal-lamps.....No.	18	0	0	0.0	0.0
Removing existing superstructures, lump sum	\$200	0	\$75	0.0	25.0
Maintaining highway traffic.....lump sum	\$1,000	\$100	\$325	10.0	82.5
Maintaining navigation.....lump sum	\$300	\$200	\$300	66.7	100.0
Offer-dams, pumping, bailing and draining.....lump sum	\$10,000	\$3,000	\$10,000	30.0	100.0
Steel sheet-piling.....sq. ft.	10,900	6,614	8,156	60.7	74.8
Gross estimate at contract prices.....	\$142,578 70	\$58,938 29	\$120,167 78	41.3	84.3



*Contract M*

This contract provides for power-plants, electrical equipment and machinery for operating and lighting locks Nos. 1, 2, 3 and 4, Cayuga and Seneca canal. It was awarded to Lupfer & Remick, being signed on November 5, 1914. Work was started on January 23, 1915. The engineer's preliminary estimate was \$176,-087.00, the contractor's bid, \$188,031.00. The contract price as modified by alteration No. 1 is \$191,436.00.

R. W. Cady, Assistant Engineer, was in charge until March 30, 1917, and since then C. H. Swick, Assistant Engineer, has been in charge.

At lock No. 1 the gate and valve machines and the gasoline-electric equipment have been completed during the year, lamp poles have been erected, maintenance accessories have been furnished, the final test has been run and this part of the work has been accepted.

At locks Nos. 2 and 3 concrete conduits have been completed and some lead cable drawn in; coffer-dams were built in the wheel pits and sluice-gate pits; sluice-gate equipment is being placed; the generators were assembled; erection of lamp poles was finished.

At lock No. 4 armored cable was laid from the power-house to the guard-gate over the old canal, the inside of the power-house was painted, the final test was run and this part of the contract was accepted.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Coffer-dams, pumping, bailing and draining.....	lump sum \$1,000	\$300	\$700	30.0	70.0
Excavation.....	cu. yds. 875	62	497	7.1	56.8
Forming embankment.....	cu. yds. 460	24	350	5.2	76.1
Lining.....	cu. yds. 15	17	17	113.3	113.3
Second-class concrete.....	cu. yds. 163	5	152	2.7	83.1
First-class reinforced concrete.....	cu. yds. 540	6	534	1.1	98.9
Cast-iron pipe.....	lbs. 7,500	0	5,107	0.0	68.1
Trenching and backfilling for pipe.....	lin. ft. 280	0	254	0.0	90.7
Structural steel.....	lbs. 39,690	0	22,592	0.0	56.9
Metal in sluice-gate equipment.....	lbs. 91,000	51,660	51,660	56.8	56.8
Metal reinforcement.....	lbs. 45,469	0	40,821	0.0	89.8
Chipping concrete.....	cu. ft. *371	22	367	5.9	98.9

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Chipping edges of machinery recesses, lin. ft.	930	0	803	0.0	86.3
Hydraulic equipment, lock No. 2, lump sum	\$5,500	0	\$550	0.0	10.0
Hydraulic equipment, lock No. 4, lump sum	\$4,500	\$270	\$4,500	6.0	100.0
Traveling cranes.....No.	3	0.10	2.95	3.3	98.3
Lock maintenance accessories.....No.	4	2	2	50.0	50.0
Gasoline-electric station maintenance accessories.....lump sum	\$500	\$500	\$500	100.0	100.0
Station maintenance accessories.....No.	2	0.40	1	20.0	50.0
Electric equipment, power-house, lock No. 1.....lump sum	\$9,000	\$720	\$9,000	8.0	100.0
Electrical equipments, power-houses, lock No. 2 and lock No. 4.....No.	2	0.06	1	3.0	50.0
Lead-covered, rubber-insulated conductors.....lbs.	18,300	1,160	13,274	6.3	73.5
Armored conductors.....lbs.	29,800	6,084	27,914	20.4	93.7
Trenching and backfilling for conductors.....lin. ft.	4,000	345	3,007	8.6	75.2
Fiber duct.....lin. ft.	4,409	537	3,825	12.2	86.8
Metal duct.....lbs.	16,000	792	15,245	4.9	95.3
Drilling 1½-in. holes.....lin. ft.	181	0	94	0.0	51.9
Drilling 3-in. holes.....lin. ft.	320	0	329	0.0	102.8
Arc lamps.....No.	32	28.4	28.4	88.8	88.8
Lamp-poles.....No.	31	14.83	28.9	47.8	93.2
Electric capstans.....No.	7	0.50	6.51	7.1	93.0
7-hp. gate equipments.....No.	14	0.68	13.40	4.9	95.7
7-hp. valve equipments.....No.	6	0	5.4	0.0	90.0
3-hp. valve equipments.....No.	8	0.68	8	8.5	100.0
Guard-gate equipments.....No.	3	0	3	0.0	100.0
Installing and testing guard-gate equipments.....No.	3	0.20	2.7	6.7	90.0
Moving hand-rails.....No.	7	0	6	0.0	85.7
Tile roofing.....squares	43	0	38	0.0	88.4
Doors, windows, woodwork and hardware.....No.	3	0	3	0.0	100.0
Painting concrete.....sq. yds.	1,200	603	603	50.2	50.2
Gross estimate at contract prices.....	*\$191,796 00	\$18,769 66	\$165,102 04	9.8	86.1

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Chipping concrete, 150 cu. ft., by resolution dated June 30, 1915.  
This quantity at the contract price amounts to \$360.00.

### Contract A-1

This contract provides for making repairs to and constructing a fish-ladder around dam No. 1, near Cayuga. It was awarded to the Sherman-Stalter Company, being signed on July 24, 1916. Work began August 21, 1916. The engineer's preliminary estimate was \$29,019.30, the contractor's bid, \$25,831.05. The contract price as modified by alteration No. 1 is \$26,842.50.

R. W. Cady, Assistant Engineer, was in charge until March 30, 1917; since then C. H. Swick, Assistant Engineer, has been in charge.

Alteration No. 1, approved by the Canal Board November 2, 1916, changed the plans for the fish-ladder and permitted the use of second-quality steel sheet-piling. It increased the amount of the contract price by \$1,011.45.

Work on this contract started August 21, 1916, and has been completed except for some work of cleaning up; the final estimate has been completed, but the final account has not been rendered, pending the finishing of the clean-up work.

The repairs to the dam under this contract consisted in making a cut-off of steel sheet-piling 35 feet long extending the entire length of the dam. The piling was driven on the upstream side of the dam, to such a depth that the top was level with the sill of the dam and about two feet from it. The space between was sealed with concrete. The concrete mixing plant was on a scow and the concrete was placed by means of an 8-inch pipe used as a chute. The piles were driven by a floating pile-driver. To avoid a head of water on this structure while work was in progress, a temporary dam was constructed about 2,000 feet downstream.

By the alteration about 105 feet of the flume for the fish-ladder was changed from an open earth cut to a reinforced concrete trough with struts across the top about eight feet apart. This alteration also provided for wash wall in the open cut at the upstream end of the fish-ladder.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Coffer-dam, pumping, bailing and draining.....	lump sum \$1,000	\$900	90.0
Excavation.....	cu. yds. 1,970	1,470	74.6
Forming embankment.....	cu. yds. 490	140	28.6
Lining.....	cu. yds. 555	400	72.1
Steel sheet-piling.....	sq. ft. 8,390	7,087	84.5
Second-class concrete.....	cu. yds. 235	211	89.8
Concrete in fish-ladder.....	cu. yds. 155	138	89.0
Metal reinforcement.....	lbs. 4,450	4,000	89.9
Repairing, maintaining and removing temporary dam.....	lump sum \$3,600	\$3,240	90.0
Wash wall.....	cu. yds. 30	25	83.3
Second-quality steel sheet-piling 35 feet long.....	sq. ft. 4,375	4,805	109.8
Gross estimate at contract prices.....	*\$26,870 50	\$24,142 50	89.8

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Metal reinforcement, 700 lbs., by resolution dated Jan. 25, 1917.  
This quantity at the contract price amounts to \$23.03.

*Contract D*

This contract provided for excavating a channel in the Seneca river from the vicinity of Demont's bridge through the village of Waterloo. Length, 7.52 miles. It was awarded to the Sherman-Stalter Co., being signed on February 24, 1914. Work was started on March 20, 1914. The engineer's preliminary estimate was \$1,308,765.00, the contractor's bid, \$1,004,555.00. The contract price as modified by alterations Nos. 1, 2, 3, 4 and 5 was \$1,059,553.00.

The contract was accepted by the Canal Board March 1, 1917, and the final estimate, amounting to \$944,063.92, approved December 4, 1917.

H. N. Metzger, Assistant Engineer, was in charge.

Alteration No. 1, approved by the Canal Board August 25, 1914, provides for changing the alignment of the canal in the vicinity of Gorham street, Waterloo, from Sta. 6388+00 to Sta. 6403+00. This change was necessary because, if the canal were excavated as originally planned, the north prism slope would be very near one of the buildings of the Waterloo Woolen Co. This would endanger this building and also cut off the company's road that is in existence at this place. This would cause excessive damage claims against the State. This alteration decreased the amount of the contract by \$3,363.00.

Alteration No. 2, approved by the Canal Board February 23, 1915, provides for use of equivalent excavation slope, Sta. 6050 to Sta. 6078, and for increasing the capacity of the spoil banks by extending them towards the top edge of the prism from Sta. 6178 to Sta. 6193.

Alteration No. 3, approved by the Canal Board May 18, 1915, provided for filling back of vertical wall between Ovid and Bridge streets, Seneca Falls, for additional filling in the bed of Benton creek between Bayard and Center streets, for building stone-filled timber cribs at Benton creek, and for building new head-wall to Bayard street culvert. The reasons for this alteration were as follows: The fill behind the vertical wall was originally on contract C, fill to be obtained from a borrow-pit. It developed that this fill could be made to better advantage and with a considerable saving

to the State with spoil from the hydraulic dredges on contract D. By agreement between the State and the contractors involved this fill was taken from contract C and placed in contract D. This part of the alteration increased the amount of contract D by \$53,536.00 and decreased the amount of contract C by \$61,140.00, thus saving the State \$7,604.00. The filling in Benton creek was for the purpose of changing the limits of spoil area, to provide a more practical area for making the fill with the hydraulic dredges. The stone-filled timber cribs were provided to prevent the culverts from being filled up by spoil. The new head-wall to the Bayard street culvert was provided because the old one was in bad condition. This alteration, as a whole, increased the amount of this contract by \$56,761.00.

Alteration No. 4, approved by the Canal Board August 11, 1915, provides for maintaining highway traffic at Kingdom road bridge. In order to make the excavation in the vicinity of Kingdom road, it was deemed advisable to remove the old bridge structure to a new location. This alteration increased the amount of the contract by \$1,600.00.

Alteration No. 5, approved by the Canal Board April 26, 1916, provides for emergency spoil-banks between Seneca Falls and Waterloo. To provide for the continuation of the construction on this contract while the basin above dam No. 2 was unwatered it was necessary to provide emergency spoil-banks adjacent to the prism slope for the dipper-dredge excavation. On these spoil areas the spoil was limited to elevation 442.0. This alteration does not affect the amount of the contract.

Extra work order dated November 16, 1914, provides for constructing a drain through the spoil-bank in the village of Waterloo, for permanent drainage of adjacent orchard property.

Extra work order dated December 27, 1915, provides for excavating material deposited in the channel below dam No. 2, caused by washout at dam No. 2, Seneca Falls.

During the year the dipper-dredge, assisted by the clam-shell scow and drill-boat, excavated between Waterloo and Seneca Falls and above Waterloo, either casting spoil upon the bank or scowing it to the basin above dam No. 2 at Seneca Falls. The spoil-banks were graded to elevation 442.0, as required in alteration No. 4, the derrick-scow removing the large boulders. The fill back of the north retaining wall between Ovid and Bridge streets was graded,



BARGE CANAL, CONTRACT C

Flight of two locks, dam, State power-house and power company's power-house at Seneca Falls.



MIDDLE DIVISION: CAYUGA AND SENECA RESIDENCY 259

material being taken from a flat scow and dumped into the low places by the clam-shell scow. This fill was provided by alteration No. 3. The wooden approach to the temporary bridge at Demont's was removed. Highway traffic was maintained at Kingdom road bridge, as provided by alteration No. 5. Some drainage ditches were excavated on spoil areas. Navigation was maintained. The prism was swept, thus completing the work on contract D.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Clearing.....lump sum	\$100	\$100	\$100	100.0	100.0
Excavation.....cu. yds.	1,683,800	26,759	1,490,004	15.9	88.5
Third-class riprap.....cu. yds.	100	0	0	0.0	0.0
Maintaining traffic.....seasons	3	0.70	1.76	23.3	58.7
Backfilling for vertical wall.....cu. yds.	95,600	351	99,351	0.4	103.9
Stone-filled timber cribs at Benton creek and building new head-wall at Bayard street culvert.....lump sum	\$3,225	0	\$3,225	0.0	100.0
Maintaining highway traffic at Kingdom road bridge.....lump sum	\$1,600	\$320	\$1,600	20.0	80.0
Gross estimate at contract prices.....	\$1,059,553 00	\$13,789 62	\$944,063 92	1.3	89.1
<i>Extra Work Orders</i>					
Nov. 16, 1914.....cost plus 15 per cent			\$265 90		Finished
Dec. 27, 1915.....lump sum	\$4,200 00		4,200 00		Finished
Total.....			\$4,465 90		

*Contract C*

This contract provided for constructing two locks, a dam, etc., at Seneca Falls. Length, 1.1 miles. It was let to Larkin & Sangster, the contract being signed on January 11, 1913. Work was started February 11, 1913. The engineer's preliminary estimate was \$1,140,872.50, the contractor's bid, \$1,187,047.50.

The contract was accepted by the Canal Board December 15, 1915, and the final estimate, amounting to \$1,101,719.73, approved August 24, 1916.

M. L. Babcock, Leveler, was in charge during the past year.

Extra work order dated February 10, 1914, provides for entirely removing three buildings at the site of the Ovid street bridge, to facilitate construction.

Extra work order dated February 14, 1914, provides for removing certain buildings near the Ovid street bridge.



Extra work order dated May 22, 1914, provides for removing a portion or all of certain buildings which intercept the line of the wall between Ovid and Bridge streets, in order to construct this wall.

Extra work order dated November 19, 1914, provides for maintaining foot traffic over the canal at or near Bridge street in Seneca Falls, by means of a bridge or other satisfactory method.

Extra work order dated July 22, 1915, provides new window sills, frames and windows and waterproofing for two brick piers in the basement of the Seneca Falls Episcopal church, also fertilizing and seeding spoil placed on lawns of the Catholic Parish school and Dr. C. Anna Brown's hospital.

Extra work order dated September 10, 1915, provides for extending core wall at the north end of dam No. 2 at Seneca Falls.

Extra work order dated October 5, 1915, provides for repairing embankment south of lock No. 3, and constructing a concrete apron below dam No. 2 at Seneca Falls.

Extra work order dated December 13, 1915, provides for underpinning the buildings of the Seneca Falls Woolen Company and filling around and under them and for placing guard-posts across the old roadway at Ovid street.

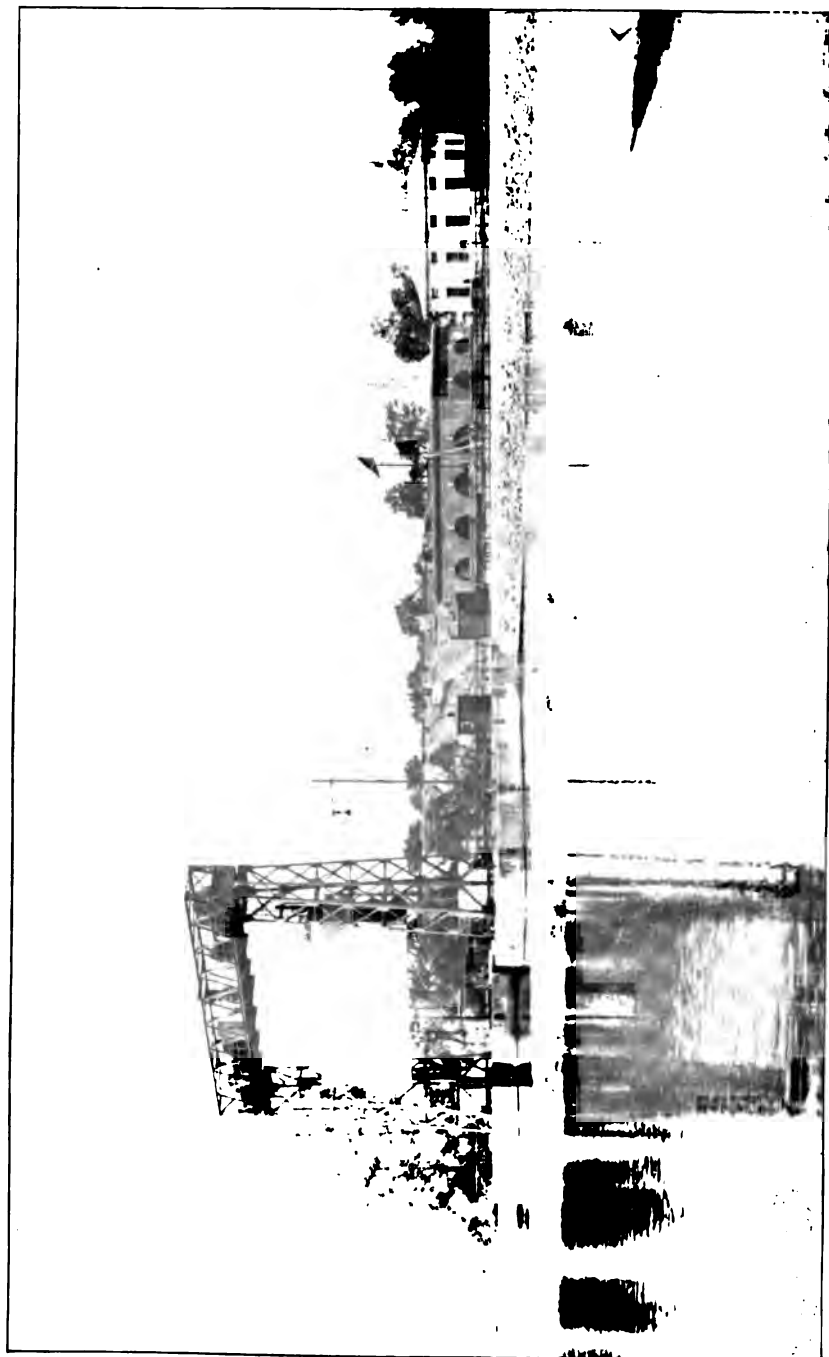
Extra work order dated December 14, 1915, provides for placing under-drains in, and concrete covering on the fill inside of the Episcopal church at Seneca Falls.

Extra work order dated December 15, 1915, provides wrought-iron pipe railing on locks Nos. 2 and 5, on dam No. 2, and on bridge approaches at Ovid and Bridge streets, Seneca Falls.

On the original contract some finishing of concrete surfaces was done.

Work under the extra work order dated December 13, 1915, was finished August 5, 1916. The fill was brought from the Haigh street borrow-pit in dump-wagons and spread by men with shovels or drawn under the buildings by a scraper operated with a gasoline engine.

Railings were placed on the bridge approaches at Ovid and Bridge streets as directed by extra work order dated December 15, 1915, thereby completing the work under this order.



BARGE CANAL, CONTRACT C

A view above the locks and dam at Seneca Falls, showing the guard-gate at the head of the flight of two locks and the lower end of the pool impounded by the dam.



MIDDLE DIVISION: CAYUGA AND SENECA RESIDENCY 261

All the work orders on this contract have now been paid except one dated October 5, 1915, on which no work has been done during the year.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
Clearing.....	lump sum \$50	\$50	100.0
Excavation.....	cu. yds. 242,680	172,091	70.9
Forming embankment.....	cu. yds. 39,150	28,060	71.7
Lining.....	cu. yds. 184	62	33.7
Sawed lumber, yellow pine.....	ft. B. M. 3,600	3,002	83.4
White oak lumber in water-sills.....	ft. B. M. 2,400	2,317	96.5
Foundation piles.....	lin. ft. 36,000	10,758	29.9
Wooden sheet-piling.....	ft. B. M. 129,000	2,483	1.9
Second-class concrete.....	cu. yds. 131,420	126,272.6	96.1
First-class masonry bridge coping.....	cu. yds. 5.7	5.51	96.7
Structural steel.....	lbs. 19,670	19,542	99.3
Metal reinforcement.....	lbs. 38,920	37,685	96.6
Bronze.....	lbs. 1,500	1,371	91.4
Steel castings, plain.....	lbs. 13,100	13,104	100.0
Steel castings, machined.....	lbs. 1,000	850	85.0
Iron castings, plain.....	lbs. 16,240	15,201	93.6
Iron castings, machined.....	lbs. 28,080	24,821	88.4
Portland cement sidewalks.....	sq. ft. 6,960	6,338	91.1
Concrete curbs.....	lin. ft. 1,250	1,192	95.4
Brick pavement.....	sq. yds. 85	0	0.0
Wooden fence.....	lin. ft. 570	484	84.4
Coffer-dams, pumping, bailing and draining.....	lump sum \$45,000	\$45,000	100.0
Sheeting and bracing.....	ft. B. M. 12,300	2,922	23.8
Flagstone sidewalks, relaid.....	sq. yds. 242	182	75.2
Timber in cribs.....	ft. B. M. 1109,872	11,400.9	1.0
Stone filling in cribs.....	cu. yds. 2,820	2,225.7	78.9
Medina block-pavement.....	sq. yds. 55,000	43,828	79.7
Sawed lumber in crib dam.....	ft. B. M. 800	644.2	80.5
Stone filling in crib dams.....	cu. yds. 800	644.2	80.5
Deduct for removal of Maier building.....	lump sum \$50	\$50	100.0
Trenching and backfilling for 24-in. pipe.....	lin. ft. 3,120	3,084	98.8
Trenching and backfilling for 20-in. pipe.....	lin. ft. 115	114.5	99.6
Raising manholes.....	lin. ft. 140	145.9	104.2
Cast-iron pipe.....	tons 383	387.28	99.8
Cast-iron pipe specials.....	tons 3.5	3.429	98.0
10-in. flap-valve.....	lump sum \$30	0	0.0
Underpinning and supporting buildings.....	lump sum \$39,107	\$39,107	100.0
Fourth-class riprap.....	cu. yds. 1,220	875.6	71.8
Filling in basement of church.....	cu. yds. 1,800	1,426	79.2
Placing fill on church grounds.....	cu. yds. 12,000	7,908	65.9
Digging trench and backfilling same, purchasing and disposing of pipe and incidental work for sewer at Seneca Falls Woolen Co.....	lump sum \$3,900	\$3,900	100.0
Gross estimate at contract prices.....	\$1,196,797.20	\$1,101,719.73	92.1
<i>Extra Work Orders</i>			
Feb. 10, 1914.....	special unit price \$360.00	\$360.00	Finished
Feb. 14, 1914.....	special unit prices 240.00	249.00	Finished
May 22, 1914.....	lump sum 800.00	800.00	Finished
Nov. 19, 1914.....	cost plus 15 per cent 418.10	418.10	Finished
July 22, 1915.....	cost plus 15 per cent 601.84	601.84	Finished
Sept. 10, 1915.....	cost plus 15 per cent 42,325.19	42,325.19	Finished
Oct. 5, 1915.....	cost plus 15 per cent 8,280.54	8,280.54	Finished
Dec. 13, 1915, cost plus 15 per cent, special unit price and lump sum.....	13,622.73	13,622.73	Finished
Dec. 14, 1915.....	lump sum 490.00	490.00	Finished
Dec. 15, 1915.....	contract unit price 2,860.00	2,771.00	Finished
Total.....		\$60,909.40	

\* Figures given include excess quantities authorized by the Canal Board, as follows:

Iron castings, machined, 18,000 lbs., by resolution dated December 4, 1914.

Cast-iron pipe specials, 2 tons, by resolution dated Nov. 23, 1915.

These quantities at the contract prices amount to \$1,390.00.

† Items used in accordance with plans for alteration No. 2. No quantities were given in the preliminary estimate.

*Contract G*

This contract provided for furnishing and erecting the lock-gates, lock-valves and buffer-beams for locks Nos. 2, 3 and 4, the needle-beam for the spillway in dam No. 2, the superstructure for the Taintor gates at Waterloo, the guard-gates at locks Nos. 3 and 4 and over the old canal at Waterloo and all incidental work. It was awarded to Lupfer & Remick, being signed on November 24, 1914. Work was started on March 9, 1915. The engineer's preliminary estimate was \$119,809.00, the contractor's bid, \$110,115.00.

The contract was accepted by the Canal Board and the final account, amounting to \$102,004.11, approved December 13, 1916.

R. W. Cady, Assistant Engineer, was in charge.

There was one extra work order.

During the year the following work was done:

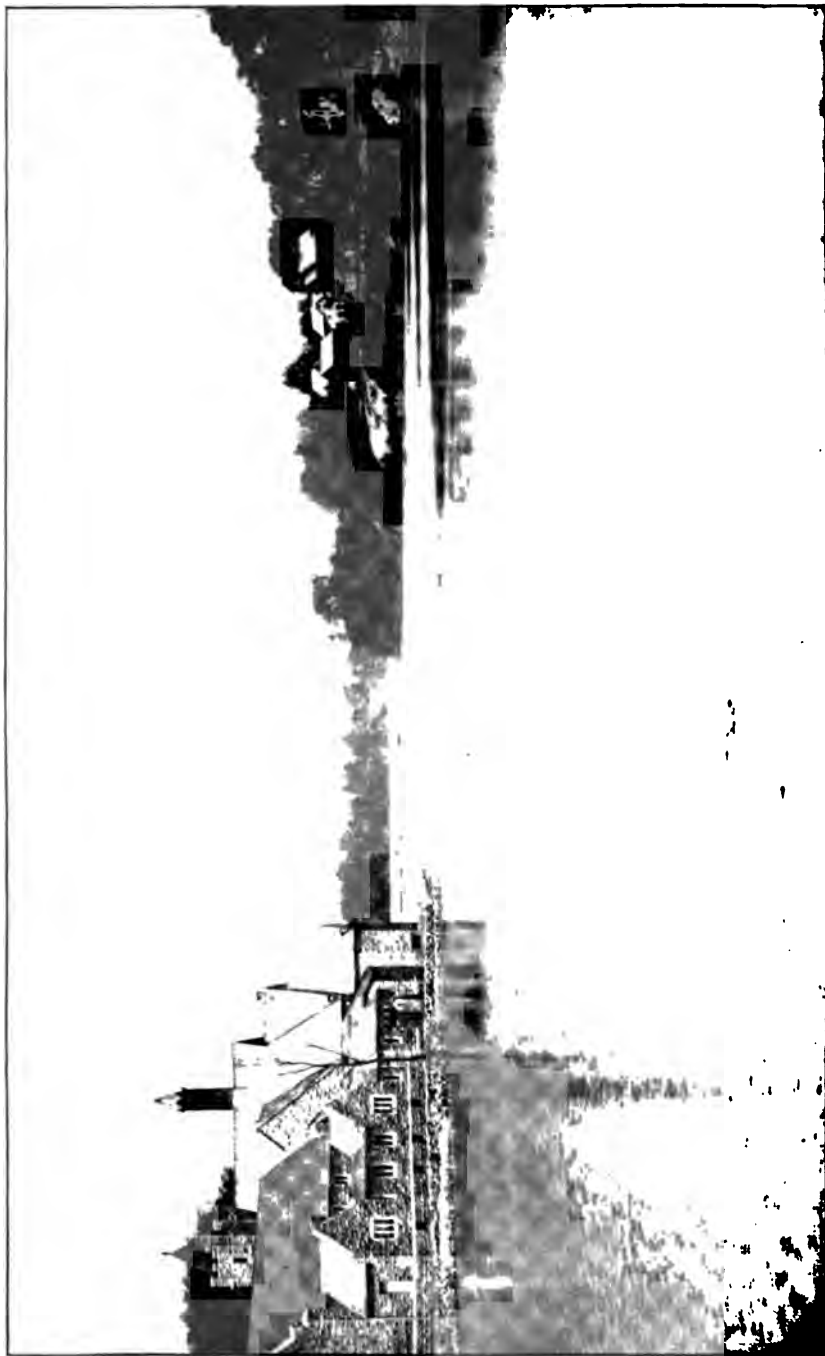
At locks Nos. 2 and 3 the painting of steelwork was finished, the buffer-beam was repaired and the guard-gate was tested.

At lock No. 4 the painting of steelwork was finished, the needle-beam anchorages in Taintor gate piers were grouted, the Taintor gates were fitted and tested, the surfaces of counterweights of Taintor gates were finished, the guard-gates at lock No. 4 and over the old canal were tested and numerous adjustments and repairs were made.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Dimension lumber in lock-gates ft. B. M.	221,000	7,600	226,600	34.4	102.5
Yellow pine sawed lumber.....ft. B. M.	*37,400	1,714	31,714	4.6	84.8
Second-class concrete.....cu. yds.	127	5	135	3.9	106.3
Structural steel.....lbs.	836,000	50,170	859,421	6.0	102.8
Metal reinforcement.....lbs.	14,000	0	12,780	0.0	91.3
Machinery.....lbs.	382,000	12,080	304,277	3.2	79.6
Cast-iron counterweights and keys..lbs.	278,000	0	75,611	0.0	27.2
Installing electrical equipment and testing (at guard-gates).....No.	3	0	0	0.0	0.0
Gross estimate at contract prices.....	*\$111,090 00	\$4,594 45	\$102,004 11	4.1	91.9
<i>Extra Work Order</i>					
Mar. 5, 1915, contract and special unit prices.....	\$336 00	.....	\$292 11	.....	Finished

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Yellow pine sawed lumber, 15,000 ft. B. M., by resolution dated July 9, 1915.  
This quantity at the contract price amounts to \$975 00.



BARGE CANAL, CONTRACT C

Pool above the locks and dam at Seneca Falls. On most of the properties submerged the buildings were razed. The basement of the church seen in the view was filled in and the property was protected by a wall.



*Contract P*

This contract provides for constructing a concrete cut-off wall below the walls of lock No. 3, Seneca Falls. It was awarded to The Foundation Company, being signed on June 8, 1917. Work was started on June 11, 1917. The engineer's preliminary estimate was \$76,412.50, the contractor's bid, \$82,850.00.

C. H. Swick, Assistant Engineer, is in charge.

The work so far on this contract has consisted in transporting the plant from the railroad station and erecting it at the site of the contract.

*Contract L*

This contract provides for the substructures, superstructures and approaches of two highway bridges, one at Gorham street, Waterloo, and the other at Kingdom road, between Waterloo and Seneca Falls. It was awarded to Scott Brothers, being signed on September 23, 1915. Work was started on October 5, 1915. The engineer's preliminary estimate was \$71,469.25, the contractor's bid, \$59,928.40.

C. H. Swick, Assistant Engineer, is in charge.

An extra work order dated September 16, 1916, provided for removing and replacing the steelwork and false work necessary to pass dredges and for expenses due to delay of contract work in this connection. The reason was to facilitate work on contract D and to open the canal for navigation through new lock No. 4 at Waterloo. The final account of this extra work order, amounting to \$2,004.69, was approved by the Canal Board on October 11, 1916.

During the year at Gorham street bridge the erection of the superstructure was finished and the steelwork was painted; the floor, consisting of concrete with a brick wearing surface, was laid complete; the concrete sidewalk was also laid complete; the north and south approaches were finished; the wooden fence was built.



At Kingdom road bridge the south abutment was finished, the coffer-dam around it was pulled and the piles redriven to form a coffer-dam for the north abutment; necessary excavation was made at the site of the north abutment, this abutment was built and the coffer-dam was pulled; the steel superstructure was erected and painted; the six-inch wooden floor was laid; the south approach was finished and the north approach was built with material taken from adjacent spoil areas and appropriated land and placed with wheel scrapers; the wooden fence was built.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation.....cu. yds.	21,000	7,255	14,511	34.5	69.1
Lining.....cu. yds.	500	438	445	87.6	89.0
Sawed lumber.....ft. B. M.	16,500	15,255	15,255	92.5	92.5
Second-class concrete.....cu. yds.	3,500	1,566	3,153	44.5	90.1
First-class reinforced concrete.....cu. yds.	106	99	99	93.4	93.4
Fourth-class riprap.....cu. yds.	590	128	128	21.7	21.7
Structural steel.....lbs.	344,000	133,841	313,236	38.9	91.0
Metal reinforcement.....lbs.	16,500	14,898	14,898	90.3	90.3
Cobblestone gutter.....sq. yds.	95	89	89	93.7	93.7
Brick pavement.....sq. yds.	265	251	251	94.7	94.7
Wooden fence.....lin. ft.	1,240	1,185	1,185	95.5	95.5
Lattice railing.....lin. ft.	137	129	129	94.2	94.2
Removing existing superstructure at Gorham street.....lump sum	\$100	0	\$100	0.0	100.0
Oil signal-lamps.....No.	12	12	12	100.0	100.0
Maintaining navigation at Gorham street, lump sum	\$1	0	0	0.0	0.0
Maintaining navigation at Kingdom road, lump sum	\$1	0	0	0.0	0.0
Timber tow-path at Gorham street, lump sum	\$1	0	0	0.0	0.0
Timber tow-path at Kingdom road, lump sum	\$1	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining, lump sum	\$11,432	\$5,716	\$11,432	50.0	100.0
Gross estimate at contract prices.....	\$59,928 40	\$27,774 97	\$53,011 07	46.3	88.5
<i>Extra Work Order</i>					
Sept. 16, 1916.....lump sum	\$2,004 69	.....	\$2,034 69	.....	Finished



**PARGE CANAL, CONTRACT C**

Flashlight view of interior of tunnel cut-off at the west end of the dam at Seneca Falls. In repairing after the break of 1915 the cavern disclosed by the escaping water and the tunnel excavated through porous rock for extending the cut-off were filled with concrete.



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*Construction Work—Barge Canal*

The work done on the Cayuga and Seneca canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE						
	Contract A	Contract A-1	Contract B	Contract C	Contract D	Contract E	Contract F
1911....	\$82,450		\$349,600				
1912....	126,230		391,220				
1913....	91,840		165,660	\$241,980		\$23,950	
1914....	50,454		195,490	485,660	\$267,090	169,860	
1915....			182,730	355,660	442,460	116,920	\$28,180
1916....				18,120	220,720	5,250	33,040
1917....		\$24,140	19,063		13,794		58,940
Totals	\$350,974	\$24,140	\$1,303,763	\$1,101,720	\$944,064	\$315,980	\$120,160
<i>Extra Work Orders Paid, 1911-1917, Inclusive</i>							
1913....	\$1,785					\$1,558	
1914....	106		\$7,706				
1915....			1,500	\$1,160	\$286		
1916....				62,109	4,200	108	\$292
1917....			200	6,640			
Totals	\$1,871		\$9,406	\$69,909	\$4,486	\$1,666	\$292

YEAR *	VALUE OF WORK DONE						Totals
	Contract H	Contract I	Contract J	Contract K	Contract L	Contract M	
1911.....							\$432,050
1912.....							517,450
1913.....	\$206,560	\$135,820					865,810
1914.....	11,919	51,068					1,231,539
1915.....			\$41,960	\$59,890		\$87,130	1,365,450
1916.....			3,162	590	\$25,230	59,200	412,492
1917.....					27,780	18,770	167,091
Totals...	\$218,479	\$186,886	\$45,122	\$60,480	\$53,010	\$165,100	\$4,991,882
<i>Extra Work Orders Paid, 1911-1917, Inclusive</i>							
1913.....		\$300					\$2,065
1914.....		164					9,534
1915.....							2,926
1916.....							66,709
1917.....					\$2,005		8,845
Totals...		\$464			\$2,005		\$90,079

\* The years 1911 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.  
 NOTE.—No extra work orders were paid on these contracts during 1911 and 1912.

*Construction Work—Barge Canal Terminals*

The Barge canal terminal work on the Cayuga and Seneca canal has all been under terminal contract No. 1. During the year ended September 30, 1913, it amounted to \$23,870 and during the year ended September 30, 1914, to \$16,666. The total amount was \$40,536.

NOTE.—No extra work orders were paid on this contract.

*Foot-Bridge over Lock No. 3, at Seneca Falls*

(Chapter 700, Laws of 1915; chapter 181, Laws of 1917)

This contract was for the construction of a foot-bridge between the north and south walls of lock No. 3, on the Cayuga and Seneca canal at Seneca Falls. It was let to Lupfer and Remick, being signed on March 23, 1916. Work started September 28, 1916. The engineer's preliminary estimate was \$4,001.00, and the contractor's bid, \$4,388.10.

The final account, amounting to \$4,037.42, was approved by the Canal Board March 22, 1917.

J. A. Sloat, Leveler, was in charge of this contract.

The 80-foot span of this bridge weighed about 7 tons. It was erected upon the earth dam above lock No. 3, and then placed upon a scow and floated to a point just above the middle gates. Here it was unloaded from the scow and moved to its final position without the aid of derricks. It was necessary, however, to dismantle the operating stands, and the hand-rails on the middle gates.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent., final estimate of contract quantities
Sawed lumber.....ft. B. M.	4,800	4,622	96.3
Structural steel.....lbs.	52,000	47,637	91.6
Wrought-iron pipe railing.....lin. ft.	430	394	91.6
Chipping concrete.....cu. ft.	42	36.7	87.4
Drilling holes for bolts.....lin. ft.	80	73	91.2
Moving hand-railing.....lump sum	\$120	\$120	100.0
Gross estimate at contract prices.....	\$4,388 10	\$4,037 42	92.0

*Lehigh Valley Railroad Bridges near Seneca Outlet*

Late in August, 1916, work was started on the changes of the L. V. R. R. Company's two bridges over the canal near the outlet of Seneca lake. The plan calls for underpinning the old abutments of the westerly, or main line bridge, and raising the clearance line about one foot. For the easterly, or Ithaca branch

bridge, the plan calls for an entirely new single-span structure with the west abutment somewhat in front of the old abutment and the east abutment about in the location of the old one, the pier to be eliminated.

Work on these bridges has progressed to such a point that the Ithaca branch bridge has its two abutments nearly completed and partly backfilled and the track raised to the new grade. This is to be a single-span, through girder. As to the main line bridge, a coffer-dam has been made in front of each of the abutments and part of the excavating has been done in front of the west abutment. The track has been raised to the new grade. The company, desiring a heavier bridge at this point, has, on its own account, taken down the old superstructure and erected a complete new one, with wooden floor and with the track carried on ballast. Traffic was not cut off nor detoured by this operation.

*New York Central Railroad Bridge near Demont's*

Early in September, 1916, work was started on the rebuilding of the N. Y. C. R. R. bridge over the canal about 2 1-2 miles east of Seneca Falls. After starting the work of underpinning the old masonry, the plan was changed and the location of the new bridge moved some 30 feet upstream from the old structure. Traffic is being carried over the old bridge.

Work on the new bridge has so far progressed that the west abutment and the pier are complete, while the east abutment has been completed except for the downstream wing, which cannot be built until traffic is turned over the new bridge. New steel is on the job for the east span, but the west span will be that of the old bridge, moved over to the new substructure. New fill is being made for the approach to the west abutment.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE MIDDLE DIVISION OF THE DEPARTMENT OF THE STATE ENGINEERS AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED JUNE 30, 1917.

*Ordinary Repairs to Canals—Erie Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year	\$3,300 00	\$33 78	\$3,383 78
Edward J. Berry	Senior assistant engineer	3,060 per year	1,966 67	2 56	1,989 23
E. C. Olcott	Assistant engineer	2,208 per year	1,055 10		1,055 10
C. L. Bannister	Assistant engineer	7 00 per day	546 00		546 00
Harold Bills	Assistant engineer	6 00 per day	60 00		60 00
C. F. Hopstein	Junior assistant engineer	1,800 per year	119 52	14 70	134 22
W. S. Morris	Estimate clerk	1,800 per year	150 00	95	150 95
Harvey Wagner	Stenographer	1,500 per year	1,250 00		1,250 00
C. H. Osterhout	Fireman	900 per year	6 25		6 25
M. J. Chryst	Leveler	5 00 per day	195 00	1 80	196 80
F. W. Kinney	Rodman	4 00 per day	124 00	1 46	125 46
J. P. Walsh	Rodman	4 00 per day	24 00		24 00
C. P. Plummer	Laborer	2 00 per day	12 00		12 00
C. W. Chase	Chauffeur	1,380 per year		8 05	8 05
			\$8,808 54	\$113 30	\$8,921 84
<i>Incidental Expenses</i>					
Stationery and printing				\$40 00	
Postage				92 24	
Telephone and telegraph				107 58	
Miscellaneous				408 75	
					648 57
Total					\$9,570 41

*Ordinary Repairs to Canals—Oswego Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year		\$0 35	\$0 35
R. K. Sheldon	Assistant engineer	2,208 per year	\$18 40	4 00	22 40
J. J. Ryan	Junior assistant engineer	1,680 per year	14 00		14 00
J. P. Walsh	Junior assistant engineer	1,320 per year	11 00		11 00
C. P. Plummer	Laborer	2 50 per day	7 50		7 50
			\$50 90	\$4 35	\$55 25
<i>Incidental Expenses</i>					
Livery					6 00
Total					\$61 52

*Ordinary Repairs to Canals—Cayuga and Seneca Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year		\$25 92	\$25 92
E. C. Olcott	Assistant engineer	7 00 per day	\$238 00	4 92	242 94
C. W. Chase	Chauffeur	1,380 per year		1 65	1 65
<i>Incidental Expenses</i>			\$238 00	\$32 51	\$270 51
Livery					2 00
Total					\$272 51

*Ordinary Repairs to Canals—Black River Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer			\$1 25	\$1 25

*Construction of Barge Canal—Erie Canal*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year	\$300 00	\$27 31	\$327 31
James Burden	Senior assistant engineer	3,060 per year	3,015 00	168 50	3,183 50
L. C. Hulburd	Senior assistant engineer	3,060 per year	1,031 00	44 71	1,075 71
Edward J. Berry	Senior assistant engineer	3,060 per year	794 00	76 86	870 86
H. L. Bassett	Cashier	1,800 per year	750 00		750 00
W. S. Morris	Estimate clerk	1,800 per year	600 00	5 11	605 11
L. J. Mulhauser	Stenographer	1,500 per year	725 00		725 00
G. P. Ketchum	Stenographer	1,000 per year	908 33		908 33
C. W. Chase	Chauffeur	1,380 per year	875 00	37 40	912 40
John Connors	Janitor	1,200 per year	50 00		50 00
C. H. Osterhout	Fireman	900 per year	75 00		75 00
Margaret Sheridan	Telephone operator	600 per year	25 00		25 00
Louise E. Murphy	Telephone operator (temporary)	600 per year	27 30		27 30
D. J. Levinson	Assistant engineer	1,980 per year	1,917 00	13 60	1,930 60
J. L. Southworth	Assistant engineer	1,980 per year	1,911 00	1 35	1,912 35
Harold Bills	Assistant engineer	1,980 per year	645 00	55 50	700 50
Foster B. Crocker	Assistant engineer	2,340 per year	2,230 00	168 55	2,398 55
J. G. Palmer	Assistant engineer	2,340 per year	1,696 00	396 62	2,092 62
C. W. Costello	Assistant engineer	2,340 per year	1,331 32	55 15	1,386 47
E. M. Ellis	Assistant engineer	2,340 per year	174 00	60 80	234 80
W. J. Durkan	Assistant engineer	2,340 per year	1,271 68	447 68	1,719 36
I. S. Badger	Assistant engineer	2,340 per year	666 00	65	656 65
R. E. Swinney	Assistant engineer	2,340 per year	2,193 97	98 05	2,292 02
H. J. O'Neill	Assistant engineer	2,340 per year	2,016 23	142 82	2,159 05
C. L. Bannister	Assistant engineer	2,208 per year	315 00		315 00
R. K. Sheldon	Assistant engineer	2,208 per year	441 65	111 45	553 10
H. H. Brown	Assistant engineer	2,208 per year	1,063 83	118 06	1,181 89
George S. Haight	Assistant engineer	2,208 per year	2,162 00		2,162 00
R. W. Smith	Assistant engineer	2,208 per year	1,467 00	40	1,467 40
Geo. H. Briggs	Assistant engineer	2,208 per year	2,218 00	131 29	2,349 29
Solomon Reswick	Assistant engineer	2,208 per year	2,197 00		2,197 00
Lewis Bartlett	Assistant engineer	2,340 per year	1,311 68	35 07	1,346 75



*Construction of Barge Canal—Erie Canal—(Continued)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
B. I. Hall	Assistant engineer	\$2,208 per year	\$448 03	\$69 70	\$517 73
D. H. Judson	Assistant engineer	2,208 per year	470 71	3 92	474 63
E. C. Olcott	Assistant engineer	2,208 per year	79 73		79 73
J. L. Bush	Assistant engineer	2,208 per year	728 00		728 00
R. M. Fraser	Draftsman	1,680 per year	740 00	48 48	788 48
C. F. Hopstein	Junior assistant engineer	1,600 per year	979 52	124 64	1,104 16
N. R. McLoud	Junior assistant engineer	1,600 per year	682 85	47 16	729 73
E. C. Neudecker	Junior assistant engineer	1,680 per year	1,687 50		1,687 50
G. H. Thomas	Junior assistant engineer	1,680 per year	1,680 00	8 35	1,688 35
J. J. Cawkins	Junior assistant engineer	1,680 per year	1,628 97		1,628 97
C. V. O'Malley	Junior assistant engineer	1,680 per year	1,630 00		1,630 00
R. M. Austin	Junior assistant engineer	1,680 per year	1,610 00		1,610 00
E. L. Keeler	Junior assistant engineer	1,680 per year	456 00	13 86	469 86
J. J. Ryan	Junior assistant engineer	1,680 per year	188 11		188 11
G. L. Stillman	Junior assistant engineer	1,680 per year	1,515 72		1,515 72
M. H. Boigeol	Junior assistant engineer	1,680 per year	1,475 37		1,475 37
M. J. Chryst	Junior assistant engineer	1,680 per year	639 03	33 76	672 79
A. J. Crowe, Jr.	Junior assistant engineer	1,680 per year	1,028 77		1,028 77
D. E. Robbins	Junior assistant engineer	1,440 per year	1,381 50		1,381 50
F. E. Hardy	Junior assistant engineer	1,440 per year	228 19	2 65	230 84
Don A. Wilcox	Junior assistant engineer	1,440 per year	1,084 00		1,084 00
H. C. Smith	Junior assistant engineer	1,440 per year	456 39	6 00	462 39
J. P. Mullen	Junior assistant engineer	1,320 per year	1,252 67		1,252 67
H. A. Shafer	Junior assistant engineer	1,320 per year	1,270 00		1,270 00
D. B. Lynch	Junior assistant engineer	1,320 per year	1,282 00		1,282 00
F. J. Beach	Junior assistant engineer	1,320 per year	1,294 00		1,294 00
F. M. McCabe	Junior assistant engineer	1,320 per year	1,082 39		1,082 39
R. E. Homan	Junior assistant engineer	1,320 per year	1,166 00		1,166 00
J. P. Walsh	Junior assistant engineer	1,320 per year	130 44		130 44
J. H. Forth	Junior assistant engineer	1,200 per year	100 00		100 00
W. E. Stahl	Junior assistant engineer	1,200 per year	1,200 00		1,200 00
M. R. Howard	Junior assistant engineer	1,110 per year	1,081 53		1,081 53
E. A. Batley	Junior assistant engineer	1,080 per year	90 00		90 00
E. Hulsapple	Leveler	5 00 per day	285 00		285 00
A. T. Brown	Rodman	4 00 per day	40 00		40 00
F. W. Kinney	Rodman	4 00 per day	88 00		88 00
C. J. Sullivan	Rodman	4 00 per day	392 00		392 00
L. Kavanagh	Engineering assistant	1,020 per year	771 00		771 00
F. Luts	Engineering assistant	960 per year	928 61		928 61
E. G. Warner	Engineering assistant	960 per year	960 00		960 00
A. W. Bichel	Engineering assistant	960 per year	918 50		918 50
F. S. Corey	Engineering assistant	960 per year	921 00		921 00
R. J. Storm	Engineering assistant	960 per year	478 20		478 20
H. F. Hensler	Engineering assistant	960 per year	498 00		498 00
F. J. McMahon	Chainman	2 50 per day	85 00		85 00
Morris Elkind	Chainman	2 50 per day	245 00		245 00
J. A. Jamison	Chainman	2 50 per day	689 00		689 00
J. F. O'Brien	Chainman	3 00 per day	159 00		159 00
A. H. Hallenbeck	Inspector of engineering work	1,560 per year	1,514 00		1,514 00
W. J. Kelly	Inspector of engineering work	1,560 per year	1,640 00		1,640 00
Frank Ladd	Boatman	3 00 per day	651 00		651 00
Chas. W. Sponenburg	Boatman	3 00 per day	555 00		555 00
Wm. Scanlon	Boatman	3 00 per day	633 00		633 00
Patrick Ryan	Boatman	3 00 per day	300 00	9 92	309 92
J. H. McCabe	Boatman	3 00 per day	303 00		303 00
George Mann	Boatman	3 00 per day	54 00		54 00
C. H. Norton	Laborer	2 50 per day	660 00		660 00
G. W. Moulton	Laborer	2 50 per day	113 00		113 00
T. D. Clancy	Laborer	2 50 per day	738 00		738 00
A. F. Meyers	Laborer	2 50 per day	662 50		662 50
Joseph Reh	Laborer	2 50 per day	672 50		672 50
Frank Brophy	Laborer	2 50 per day	660 00		660 00
S. Wardwell	Laborer	2 50 per day	70 00		70 00
J. J. Cross	Laborer	2 50 per day	660 00		660 00
Floyd Voorhes	Laborer	2 50 per day	644 00		644 00
F. S. Travers	Laborer	2 50 per day	667 00		667 00
W. T. Tanner, Jr.	Laborer	2 50 per day	336 50		336 50
G. M. Wilson	Laborer	2 50 per day	500 50		500 50
Charles Smith	Laborer	2 50 per day	4 00		4 00
Curtis DuBois	Laborer	2 50 per day	4 00		4 00
Fred Smith	Laborer	2 50 per day	98 00		98 00
Fred N. Dowland	Laborer	2 50 per day	92 00		92 00
C. P. Plummer	Laborer	2 50 per day	169 00		169 00

*Construction of Barge Canal—Erie Canal—(Concluded)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Parnell Maroney	Laborer	\$2 50 per day	\$131 00		\$131 00
Franklin Burke	Laborer	2 50 per day	26 00		26 00
Henry Turk	Laborer	2 50 per day	67 50		67 50
Wm. Worden	Laborer	2 50 per day	128 00		128 00
Daniel Brown	Gage reader	84 per year	84 00		84 00
Marie Brandt Brown	Gage reader	84 per year	84 00		84 00
Wm. H. Burns	Gage reader	60 per year	60 00		60 00
Charles Bourke	Gage reader	60 per year	55 00		55 00
James R. Bixby	Gage reader	84 per year	84 00		84 00
A. C. Carr	Gage reader	60 per year	15 00		15 00
John Chamberlain	Gage reader	60 per year	31 29		31 29
Fred Chamberlain	Gage reader	60 per year	28 71		28 71
W. H. Dunn	Gage reader	60 per year	60 00		60 00
Geo. Ebeling	Gage reader	120 per year	120 00		120 00
A. R. Gates	Gage reader	60 per year	60 00		60 00
Mrs. Martha Hannon	Gage reader	48 per year	48 00		48 00
A. R. Merritt	Gage reader	60 per year	55 00		55 00
Mrs. A. H. Hoffmeister	Gage reader	84 per year	84 00		84 00
Mrs. John R. Hiller	Gage reader	84 per year	84 00		84 00
Mark Kennedy	Gage reader	60 per year	60 00		60 00
H. H. Lefebvre	Gage reader	84 per year	84 00		84 00
O. D. Merwin	Gage reader	84 per year	28 00		28 00
W. S. Siver	Gage reader	84 per year	56 00		56 00
LaRu Sitterly	Gage reader	84 per year	76 00		76 00
Arthur Mason	Gage reader	84 per year	42 00		42 00
Wm. Prettie	Gage reader	120 per year	120 00		120 00
John Phillips	Gage reader	72 per year	72 00		72 00
Marie Powell	Gage reader	84 per year	84 00		84 00
Mark Quimby	Gage reader	60 per year	60 00		60 00
Frank Shane	Gage reader	60 per year	60 00		60 00
H. D. Schmidt	Livery			\$720 00	720 00
J. J. Lewis	Livery			476 00	476 00
W. J. Helfert	Livery			320 00	320 00
John D. Guflo	Livery			825 00	825 00
E. A. Thomas	Livery			279 00	279 00
C. J. Connors	Livery			506 00	506 00
George E. Wright	Livery			428 00	428 00
C. H. Lefebvre	Livery			15 00	15 00
L. A. Withey	Livery			125 00	125 00
Calkins & Springstead	Livery			225 00	225 00
G. D. Springstead	Livery			227 50	227 50
Neil Havens	Livery			1,757 25	1,757 25
H. W. Noble	Livery			27 00	27 00
Stanwix Hall Livery	Livery			361 00	361 00
C. L. Hickland	Livery			450 00	450 00
C. G. Smith	Livery			216 00	216 00
Earl H. Jones	Livery			48 00	48 00
James Waters	Livery			38 40	38 40
M. K. Ryan	Livery			57 00	57 00
			\$39,000 95	\$9,659 49	\$98,660 44
<i>Incidental Expenses</i>					
Instruments and tools				\$59 92	
Office rent				1,105 00	
Fuel and light				516 58	
Stationery and printing				180 35	
Postage				229 11	
Telephone and telegraph				745 65	
Miscellaneous				2,898 17	
					5,734 78
Total					\$104,395 22

*Construction of Barge Canal—Oswego Canal*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year	\$400 00	\$3 35	\$403 35
L. C. Hulburd	Senior assistant engineer	3,080 per year	903 00	123 85	1,031 35
W. S. Morris	Estimate clerk	1,800 per year	300 00	1 75	301 75
Henry L. Bassett	Cashier	1,800 per year	800 00		300 00
W. D. Gartland	Stenographer	1,200 per year	926 67		926 67
L. J. Mulhauser	Stenographer	1,500 per year	50 00		50 00
Charles W. Chase	Chauffeur	1,380 per year	115 00	3 60	118 60
John Connors	Janitor	600 per year	150 00		150 00
C. H. Osterhout	Fireman	900 per year	37 50		37 50
Margaret Sheridan	Telephone operator	600 per year	125 00		125 00
I. S. Badger	Assistant engineer	2,340 per year	747 50	11 62	759 12
Chas. W. Costello	Assistant engineer	2,340 per year	710 65		710 65
Edward M. Ellis	Assistant engineer	2,340 per year	1,812 71	559 49	2,372 20
Geo. H. Haley	Assistant engineer	2,340 per year	708 48	141 14	849 62
D. H. Judson	Assistant engineer	2,205 per year	821 94	29 31	851 25
H. H. Brown	Assistant engineer	2,205 per year	1,133 17	9 20	1,142 37
P. H. Budd	Assistant engineer	2,205 per year	61 34	39 02	100 36
W. S. Saxton	Assistant engineer	1,980 per year	1,905 00		1,905 00
R. W. Smith	Assistant engineer	2,205 per year	56 00		56 00
C. L. Bannister	Assistant engineer	2,205 per year	63 00		63 00
C. F. Hopstein	Junior assistant engineer	1,800 per year	120 00	113 65	233 65
E. L. Keeler	Junior assistant engineer	1,680 per year	655 00	2 10	657 10
W. E. Hinman	Junior assistant engineer	1,560 per year	112 13		112 13
E. Hulsapple	Junior assistant engineer	1,569 per year	382 00		382 00
C. L. Fox	Junior assistant engineer	1,560 per year	295 13		296 13
E. C. Ansley	Junior assistant engineer	1,560 per year	1,143 05		1,143 05
A. J. Crowe, Jr.	Junior assistant engineer	1,560 per year	536 23		536 23
N. R. McLoud	Junior assistant engineer	1,800 per year	992 42	180 65	1,173 07
H. T. Brown	Junior assistant engineer	1,320 per year	759 73		759 73
H. L. DuBois	Junior assistant engineer	1,320 per year	1,282 00		1,282 00
F. J. McMahon	Junior assistant engineer	1,040 per year	98 00		98 00
J. E. Smith	Junior assistant engineer	1,800 per year	45 76	3 50	49 26
M. H. Boigeol	Junior assistant engineer	1,501 per year	40 35		40 35
M. J. Chryst	Leveler	5 00 per day	25 00		25 00
L. H. Coit	Leveler	5 00 per day	15 00		15 00
F. E. Hardy	Leveler	4 50 per day	252 00		252 00
D. E. Robbins	Leveler	4 50 per day	36 00		36 00
Wm. Crahan	Engineering assistant	960 per year	990 00		990 00
Roy Engell	Rodman	4 00 per day	56 00		56 00
C. J. Sullivan	Rodman	4 00 per day	4 00		4 00
Daniel Scanlon	Chainman	3 00 per day	27 00		27 00
F. S. Corey	Chainman	3 00 per day	24 00		24 00
Henry Turk	Laborer	2 50 per day	557 50		557 50
Thomas Moran	Laborer	2 50 per day	6 00		6 00
G. W. Moulton	Laborer	2 50 per day	56 00		56 00
H. F. Hickey	Laborer	2 50 per day	4 00		4 00
Wm. McKinstry	Laborer	2 50 per day	4 00		4 00
Chas. Smith	Laborer	2 50 per day	391 00		391 00
C. DuBois	Laborer	2 50 per day	182 00		182 00
Patrick Hickey	Laborer	2 50 per day	27 50		27 50
John Dygert	Laborer	2 50 per day	660 00		660 00
Floyd Voorhees	Laborer	2 50 per day	16 00		16 00
Oscar Svenson	Boatman	3 00 per day	237 00		237 00
E. E. Burleigh	Boatman	3 00 per day	120 00		120 00
Thomas Moran	Boatman	3 00 per day	120 00		120 00
Patrick Ryan	Boatman	3 00 per day	3 00		3 00
Geo. E. Barnard	Boatman	3 00 per day	159 00		159 00
Leon Hallenbeck	Gage reader	60 per year	60 00		60 00
Ralph Kyle	Gage reader	60 per year	45 00		45 00
D. D. Tompkins	Gage reader	60 per year	60 00		60 00
B. M. Wilcox	Gage reader	60 per year	60 00		60 00
The Pontiac Hotel	Livery			31 75	31 75
			\$21,985 79	\$1,258 48	\$23,244 27
<i>Incidental Expenses</i>					
Office rent				\$30 00	
Fuel and light				62 80	
Stationery and printing				30 51	
Postage				49 19	
Telephone and telegraph				293 01	
Miscellaneous				1,222 66	
					1,678 17
Total					\$24,922 44

*Construction of Barge Canal—Cayuga and Seneca Canal*

Chapter 391, Laws of 1909, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton.....	Division engineer.....	\$4,800 per year	\$300 00	\$5 35	\$305 35
Edward J. Berry.....	Resident engineer.....	3,000 per year		4 44	4 44
Harvey Wagner.....	Stenographer.....	1,500 per year	125 00		125 00
W. S. Morris.....	Estimate clerk.....	1,800 per year	300 00	6 89	306 89
Henry L. Bassett.....	Cashier.....	1,800 per year	450 00		450 00
Chas. W. Chase.....	Chauffeur.....	1,200 per year	100 00	10 00	110 00
Chas. H. Osterhout.....	Fireman.....	900 per year	112 50		112 50
John Connors.....	Janitor.....	1,200 per year	150 00		150 00
Margaret Sheridan.....	Telephone operator.....	600 per year	50 00		50 00
E. C. Moore.....	Consulting engineer.....	60 00 per day	720 00	66 72	786 72
E. E. Haskell.....	Consulting engineer.....	60 00 per day	300 00	33 90	333 90
H. C. Allen.....	Consulting engineer.....	60 00 per day	360 00	15 75	375 75
Joseph Ripley.....	Consulting engineer.....	60 00 per day	138 06	33 86	171 92
H. C. Smith.....	Senior assistant engineer.....	2,820 per year	2,350 00	270 29	2,620 29
D. H. Judson.....	Assistant engineer.....	2,208 per year	540 55		540 55
C. L. Bannister.....	Assistant engineer.....	2,208 per year	1,195 00		1,195 00
E. N. Metager.....	Assistant engineer.....	2,208 per year	1,681 00	44 45	1,725 45
L. L. Hadley.....	Assistant engineer.....	2,208 per year	2,175 00	157 84	2,332 84
C. H. Swick.....	Assistant engineer.....	2,208 per year	2,280 00	59 40	2,319 40
I. S. Badger.....	Assistant engineer.....	2,340 per year	482 50	10 50	493 00
R. W. Cady.....	Assistant engineer.....	2,208 per year	1,680 00	131 50	1,811 50
R. W. Smith.....	Assistant engineer.....	2,208 per year	126 00		126 00
C. F. Hopstein.....	Junior assistant engineer.....	1,800 per year	35 00	64 69	99 69
J. H. Forth.....	Junior assistant engineer.....	1,200 per year	333 34		333 34
Lawrence Bentley.....	Junior assistant engineer.....	1,800 per year	1,737 50		1,737 50
E. N. Woodward.....	Junior assistant engineer.....	960 per year	452 16		452 16
B. J. A. Farrell.....	Junior assistant engineer.....	1,080 per year	919 73		919 73
H. L. Drake.....	Junior assistant engineer.....	1,560 per year	1,570 00		1,570 00
M. L. Babcock.....	Junior assistant engineer.....	1,560 per year	1,590 00		1,590 00
E. S. Mack.....	Junior assistant engineer.....	1,320 per year	1,270 00		1,270 00
E. S. Pollock.....	Engineering assistant.....	840 per year	764 50		764 50
W. J. Bell.....	Tracer.....	1,000 per year	83 33		83 33
M. J. Chryst.....	Leveler.....	5 00 per day	30 00		30 00
J. A. Sloat.....	Leveler.....	5 00 per day	910 00	8 00	918 00
J. R. Tighe.....	Rodman.....	4 00 per day	940 00		940 00
J. T. Phalan.....	Rodman.....	4 00 per day	742 50		742 50
Daniel Scanlon.....	Chainman.....	3 00 per day	162 00		162 00
Roy Tooke.....	Chainman.....	2 50 per day	65 00		65 00
E. F. Allen.....	Laborer.....	2 50 per day	660 00		660 00
William Philo.....	Laborer.....	2 50 per day	660 00		660 00
W. A. Bayne.....	Laborer.....	2 50 per day	497 50		497 50
Joseph Dyson.....	Laborer.....	2 50 per day	660 00		660 00
James Thorne.....	Laborer.....	2 50 per day	664 00		664 00
W. E. Lerch.....	Laborer.....	2 50 per day	582 00		582 00
G. W. Moulton.....	Laborer.....	2 50 per day	12 00		12 00
J. E. Morse.....	Laborer.....	2 50 per day	416 00		416 00
W. H. Rundle.....	Laborer.....	2 50 per day	368 00		368 00
Edward Fitzgerald.....	Cage reader.....	84 per year	21 00		21 00
E. C. McNicholas.....	Cage reader.....	84 per year	84 00		84 00
C. N. Macon.....	Cage reader.....	60 per year	60 00		60 00
E. F. Garbus.....	Cage reader.....	60 per year	60 00		60 00
William H. Lane.....	Cage reader.....	60 per year	60 00		60 00
C. D. Martin.....	Cage reader.....	60 per year	60 00		60 00
Timothy Regan.....	Cage reader.....	60 per year	60 00		60 00
Fred Wright.....	Cage reader.....	60 per year	60 00		60 00
J. H. McCabe.....	Boatman.....	3 00 per day	471 00		471 00
Hoag House Livery.....	Livery.....			14 00	14 00
D. M. Kellogg.....	Livery.....			342 00	342 00
B. C. Smith.....	Livery.....			30 00	30 00
E. C. Rolfe.....	Livery.....			50 00	50 00
			\$32,656 17	\$1,359 58	\$34,015 75
<i>Incidental Expenses</i>					
Office rent.....				\$486 75	
Fuel and light.....				32 03	
Stationery and printing.....				26 15	
Postage.....				81 60	
Telephone and telegraph.....				115 14	
Miscellaneous.....				1,149 43	
Total.....					1,891 12
					\$35,906 87

*Construction of Barge Canal Terminals*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Guy Moulton	Division engineer	\$4,800 per year	\$300 00	\$1 85	\$301 85
L. C. Hulburd	Senior assistant engineer	3,060 per year	1,081 00	45 28	1,126 28
H. L. Bassett	Cashier	1,800 per year	300 00		300 00
W. S. Morris	Estimate clerk	1,800 per year	450 00		450 00
Harvey Wagner	Stenographer	1,500 per year	125 00		125 00
L. J. Mulhauser	Stenographer	1,500 per year	725 00		725 00
Georgina P. Ketchum	Stenographer	900 per year	75 00		75 00
C. W. Chase	Chauffeur	1,380 per year	230 00	1 75	231 75
John Connors	Janitor	1,200 per year	250 00		250 00
C. H. Osterhout	Fireman	900 per year	75 00		75 00
Margaret Sheridan	Telephone operator	600 per year	100 00		100 00
Lewis Bartlett	Assistant engineer	2,340 per year	1,023 32	17 32	1,040 64
A. G. Card	Assistant engineer	2,340 per year	2,328 00	21 30	2,349 30
W. J. Durkan	Assistant engineer	2,340 per year	979 32	61 51	1,040 83
Geo. H. Haley	Assistant engineer	2,340 per year	1,668 52	35 10	1,703 62
R. E. Swinney	Assistant engineer	2,340 per year	148 03	3 80	151 83
J. G. Palmer	Assistant engineer	2,340 per year	576 00	86 95	662 95
R. W. Smith	Assistant engineer	2,208 per year	364 00	2 60	366 60
I. S. Badger	Assistant engineer	2,340 per year	371 00	7 01	378 01
Harold Bills	Assistant engineer	1,980 per year	204 00		204 00
John H. Forth	Junior assistant engineer	1,200 per year	200 00		200 00
W. J. Bell	Junior assistant engineer	1,200 per year	1,083 33		1,083 33
J. E. Smith	Junior assistant engineer	1,800 per year	1,366 74		1,366 74
W. E. Hinman	Junior assistant engineer	1,500 per year	1,222 55		1,222 55
C. G. Marilley	Junior assistant engineer	1,200 per year	872 94		872 94
J. P. Mullen	Junior assistant engineer	1,320 per year	29 33		29 33
L. H. Coit	Junior assistant engineer	1,560 per year	1,620 00		1,620 00
R. M. R. Howard	Junior assistant engineer	1,010 per year	5 97		5 97
C. L. Fox	Junior assistant engineer	1,560 per year	1,314 87		1,314 87
Roy Engell	Junior assistant engineer	1,320 per year	1,254 00		1,254 00
John S. Bierhardt	Junior assistant engineer	1,320 per year	1,270 00		1,270 00
H. C. Smith	Junior assistant engineer	1,440 per year	899 61		899 61
J. J. Gawkins	Junior assistant engineer	1,680 per year	9 03		9 03
Don. A. Wilcox	Junior assistant engineer	1,440 per year	240 00		240 00
I. L. Stalker	Tracer	5 00 per day	25 81		25 81
R. M. Fraser	Draftsman	5 00 per day	100 00		100 00
C. F. Hopstein	Draftsman	5 00 per day		3 50	3 50
E. L. Keeler	Draftsman	5 00 per day	490 00		490 00
E. Hulsapple	Leveler	5 00 per day	340 00		340 00
Geo. H. Thomas	Leveler	5 00 per day	80 00		80 00
C. J. Sullivan	Rodman	4 00 per day	608 00		608 00
H. F. Hensler	Chainman	3 00 per day	474 00		474 00
W. R. McNulty	Chainman	2 50 per day	390 00		390 00
J. F. O'Brien	Chainman	3 00 per day	369 00		369 00
L. A. Kavanagh	Chainman	3 00 per day	201 00	60	201 60
Frank Lutz	Engineering assistant	960 per year	28 39	90	29 29
A. C. Moosbrugger	Engineering assistant	1,020 per year	945 00		945 00
R. J. Storm	Engineering assistant	960 per year	481 80		481 80
Daniel Scanlon	Engineering assistant	960 per year	549 08		549 08
W. A. Walter	Inspector of engineering work	1,560 per year	1,385 33		1,385 33
W. N. Dutcher	Inspector of engineering work	1,560 per year	1,620 00		1,620 00
A. H. Hallenbeck	Inspector of engineering work	5 00 per day	30 00		30 00
Patrick Ryan	Boatman	3 00 per day	699 00		699 00
Thomas J. Fallon	Boatman	3 00 per day	570 00		570 00
Frank Ladd	Boatman	3 00 per day	303 00		303 00
Thomas Moran	Boatman	3 00 per day	822 00		822 00
P. J. Dameron	Laborer	2 00 per day	22 00		22 00
John Kerwin	Laborer	2 00 per day	68 00		68 00
Patrick Hickey	Laborer	2 50 per day	105 00		105 00
Wm. McKinstry	Laborer	2 50 per day	691 00		691 00
C. DuBois	Laborer	2 00 per day	10 00		10 00
C. Smith	Laborer	2 00 per day	8 00		8 00
G. W. Moulton	Laborer	2 50 per day	18 00		18 00
R. D. Smith	Laborer	2 50 per day	541 50		541 50
W. T. Tanner, Jr.	Laborer	2 50 per day	347 50		347 50
W. F. Hickey	Laborer	2 50 per day	535 50		535 50
			\$35,619 47	\$289 47	\$35,908 94
<i>Incidental Expenses</i>					
Instruments and tools				\$16 36	
Office rent				65 00	
Fuel and light				287 47	
Stationery and printing				39 65	
Postage				77 72	
Telephone and telegraph				132 90	
Express and freight				3 78	
Miscellaneous				980 53	
					1,604 41
Total					\$37,512 35

*Concrete River Bridge, Lyons Falls*

Chapter 246, Laws of 1913; chapter 699, Laws of 1915

NAME	RANK	Rate of Compensation	Services	Travel	Total
Guy Moulton.....	Division engineer.....	\$4,800 per year.....		\$1 25	\$1 25
Edward J. Berry.....	Senior assistant engineer.....	3,060 per year.....	\$8 50	21 24	29 74
David R. Lee.....	Assistant engineer.....	2,208 per year.....	2,337 00	10 79	2,347 79
C. F. Hopstein.....	Draftsman.....	5 00 per day.....		15 31	15 31
H. W. Grow.....	Rodman.....	4 00 per day.....	288 00		288 00
F. W. Kinney.....	Rodman.....	4 00 per day.....	300 00		300 00
J. P. Walsh.....	Rodman.....	3 50 per day.....	148 00		148 00
C. W. Chase.....	Chauffeur.....			2 50	2 50
<i>Incidental Expenses</i>			\$3,081 50	\$51 09	\$3,132 59
Livery.....				\$3 00	
Fuel and light.....				12	
Postage.....				2 81	
Office rent.....				72 92	
Telephone and telegraph.....				90	
Miscellaneous.....				533 54	
Total.....					613 29
					\$3,745 88

*Yorkville Bridge*

Chapter 745, Laws of 1913

NAME	Rank	Rate of compensation	Services	Travel	Total
Charles Kiehm.....	Assistant engineer.....	\$7 00 per day.....	\$231 00	\$6 72	\$237 72
I. S. Badger.....	Assistant engineer.....	7 00 per day.....	182 00	2 81	184 81
D. H. Judson.....	Assistant engineer.....	7 00 per day.....	371 00	2 30	373 30
E. C. Olcott.....	Assistant engineer.....	7 00 per day.....	182 00		182 00
C. G. Lamphere.....	Draftsman.....	5 00 per day.....	145 00		145 00
J. H. Forth.....	Tracer.....	1,200 per year.....	300 00		300 00
Daniel Scanlon.....	Chainman.....	8 00 per day.....	54 00		54 00
<i>Incidental Expenses</i>			\$1,465 00	\$11 33	\$1,476 33
Telephone and telegraph.....					90
Total.....					\$1,477 23

*Minetto Bridge*

Chapter 716, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
Edward M. Ellis.....	Senior assistant engineer.....	\$2,340 per year.....	\$320 29	\$18 25	\$338 54
A. T. Brown.....	Junior assistant engineer.....	1,320 per year.....	494 27		494 27
C. DuBois.....	Laborer.....	2 00 per day.....	44 00		44 00
C. Smith.....	Laborer.....	2 50 per day.....	259 00		259 00
<i>Incidental Expenses</i>			\$1,117 56	\$18 25	\$1,135 81
Livery.....				\$9 00	
Fuel and light.....				15 35	
Postage.....				1 70	
Stationery and printing.....				80	
Telephone and telegraph.....				11 70	
Miscellaneous.....				11 42	
Total.....					49 97
					\$1,185 78

*Clinton Street Bridge, Whitesboro*

Chapter 704, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
Edward J. Berry.....	Resident engineer.....	\$3,000 per year.....		\$40 58	\$40 58
Charles Kiehn.....	Assistant engineer.....	7 00 per day.....	\$21 00	50	21 50
C. F. Hopstein.....	Draftsman.....	5 00 per day.....	85 00	2 40	87 40
C. G. Lamphere.....	Draftsman.....	5 00 per day.....	5 00		5 00
J. H. Forth.....	Tracer.....	1,200 per year.....	200 00		200 00
J. P. Walsh.....	Rodman.....	4 00 per day.....	300 00	3 00	303 00
R. P. Tooke.....	Chainman.....	2 50 per day.....	67 50	1 70	69 20
<i>Incidental Expenses</i>			\$378 50	\$43 18	\$726 68
Telephone and telegraph.....				\$2 63	
Postage.....				1 69	
Miscellaneous.....				38 57	
Total.....					\$769 57

*Seneca Falls Foot-Bridge*

Chapter 703, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
C. F. Hopstein.....	Draftsman.....	\$5 00 per day.....	\$15 00		\$15 00
J. A. Sloat.....	Leveler.....	5 00 per day.....	270 00	\$2 10	272 10
<i>Incidental Expenses</i>			\$285 00	\$2 10	\$287 10
Postage.....				\$2 93	
Miscellaneous.....				31 96	
Total.....					\$321 96

*Surveys, Field Notes and Manuscript Maps—Erie Canal*

Chapter 523, Laws of 1914

NAME	Rank	Rate of compensation	Services	Travel	Total
Miscellaneous expenses.....					\$1,329 37

*Blue Line Surveys—Erie Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
Gay Moulton	Division engineer	\$4,800 per year	\$200 00		\$200 00
Edward J. Berry	Senior assistant engineer	3,060 per year	212 50	\$13 42	225 92
R. K. Sheldon	Assistant engineer	2,208 per year	1,579 28	317 70	1,896 96
B. I. Hall	Assistant engineer	2,208 per year	1,365 00	49 24	1,414 24
R. W. Smith	Assistant engineer	2,208 per year	184 00		184 00
C. L. Bannister	Assistant engineer	2,208 per year	92 00		92 00
Solomon Roswick	Assistant engineer	7 00 per day	35 00	10 66	45 66
E. C. Olcott	Assistant engineer	7 00 per day	308 00		308 00
Harold Bills	Assistant engineer	1,980 per year	1,014 00	9 13	1,023 13
M. J. Chryst	Junior assistant engineer	1,560 per year	240 97		240 97
J. J. Ryan	Junior assistant engineer	1,680 per year	1,345 89		1,345 89
C. F. Hopstein	Junior assistant engineer	1,800 per year	70 00	21 92	91 92
J. P. Walsh	Junior assistant engineer	1,320 per year	584 06		584 06
J. H. Forth	Junior assistant engineer	1,200 per year	63 33		63 33
F. E. Hardy	Leveler	4 50 per day	679 50		679 50
H. C. Kelly	Draftsman	4 00 per day	88 00		88 00
Myron Serby	Rodman	4 00 per day	256 00		256 00
R. E. Homan	Rodman	4 00 per day	44 00		44 00
C. P. Plummer	Laborer	2 50 per day	467 50		467 50
Parnell Maroney	Laborer	2 00 per day	302 00		302 00
J. F. Kerwin	Laborer	2 00 per day	10 00		10 00
R. E. Corey	Laborer	2 00 per day	114 00		114 00
T. Strohmeier	Laborer	2 00 per day	60 00		60 00
F. W. Burke	Laborer	2 00 per day	82 00		82 00
<i>Incidental Expenses</i>			\$9,397 03	\$422 07	\$9,819 10
Livery				\$600 09	
Postage				20 10	
Miscellaneous				543 49	
					1,163 68
Total					\$10,982 78

*Surveys for State Court of Claims—Erie Canal*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
E. J. Berry	Senior assistant engineer	\$3,060 per year		\$24 03	\$24 03
R. K. Sheldon	Assistant engineer	2,208 per year	\$164 67	14 80	179 47
E. C. Olcott	Assistant engineer	2,208 per year	55 20		55 20
B. I. Hall	Assistant engineer	7 00 per day	105 00	107 00	212 00
C. F. Hopstein	Junior assistant engineer	1,800 per year	205 96	39 88	245 84
J. J. Ryan	Junior assistant engineer	1,680 per year	52 00		52 00
J. P. Walsh	Junior assistant engineer	1,320 per year	66 00		66 00
J. H. Forth	Junior assistant engineer	1,200 per year	3 33		3 33
M. J. Chryst	Leveler	5 00 per day	420 00	35	420 35
F. E. Hardy	Leveler	4 50 per day	9 00		9 00
R. E. Homan	Rodman	4 00 per day	60 00		60 00
J. F. Kerwin	Laborer	2 00 per day	28 00		28 00
W. J. Sullivan	Laborer	2 00 per day	26 00		26 00
C. P. Plummer	Laborer	2 00 per day	4 00		4 00
<i>Incidental Expenses</i>			\$1,199 16	\$186 06	\$1,385 22
Livery				\$88 00	
Miscellaneous				1 25	
					89 25
Total					\$1,474 47



## SUMMARY

The foregoing tables are summarized as follows:

*Ordinary Repairs to Canals*

1. Erie canal, chapter 646, Laws of 1916.....	\$9,570 41
2. Oswego canal, chapter 646, Laws of 1916.....	61 25
3. Cayuga and Seneca canal, chapter 646, Laws of 1916.....	272 51
4. Black river canal, chapter 646, Laws of 1916.....	1 25

*Construction of Barge Canal*

5. Erie canal, chapter 147, Laws of 1903, and amendatory laws.....	104,395 22
6. Oswego canal, chapter 147, Laws 1903, and amendatory laws.....	24,922 44
7. Cayuga and Seneca canal, chapter 391, Laws of 1909, and amendatory laws.....	35,906 87

*Construction of Barge Canal Terminals*

8. Barge canal terminals, chapter 746, Laws of 1911, and amendatory laws.....	36,512 35
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*Special Work*

9 Concrete bridge, Lyons Falls, chapter 246, Laws of 1913; chapter 699, Laws of 1915.....	3,745 88
10 Yorkville bridge, chapter 745, Laws of 1913.....	1,477 23
11 Minetto bridge, chapter 716, Laws of 1915.....	1,185 78
12 Clinton street bridge, Whitesboro, chapter 704, Laws of 1915.....	769 68
13 Seneca Falls foot-bridge, chapter 700, Laws of 1915.....	321 97

*Special Surveys*

14. Surveys, field notes, etc., Erie canal, chapter 523, Laws of 1914.....	1,329 37
15. Blue line surveys, Erie canal, chapter 646, Laws of 1916.....	10,982 78
16. Surveys for State Court of Claims, chapter 646, Laws of 1916.....	1,474 47
Total.....	<u>\$233,929 36</u>

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED  
JUNE 30, 1917  
*Special Work*

CONTRACTOR	Date of contract	Character of work	ACT		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
			Chap.	Year				
Scott Brothers.....	Aug. 18, 1914	Constructing a bridge over the Erie canal in the village of Yorkville, Oneida county.....	745	1913	*\$150,000 00	\$108,180 00	\$147,361 74	\$134,854 28
			584	1915				
			728	1915				
M. Fitzgerald.....	Feb. 29, 1916	Construction of a new steel plate-girder bridge over the Erie canal at Clinton street, Whitesboro, Oneida county.....	181	1917	11,000 00	9,689 50	9,671 90	8,707 76
C. E. Wells.....	Oct. 21, 1915	Repairing the west wall of canal feeder on Main street, Oneida, Oneida county.....	704	1915	4,000 00	3,527 50	3,570 08	2,861 30
Lupfer & Remick.....	Oct. 16, 1914	Constructing a concrete bridge over the Erie canal at West Genesee street, Syracuse.....	705	1915	†20,000 00	46,485 50	43,818 32	42,839 93
Lupfer & Remick.....	Mar. 23, 1916	Constructing a foot-bridge across lock No. 3 at Seneca Falls.....	715	1913	5,000 00	4,001 00	4,388 10	4,037 42
			728	1915				
			700	1915				
			181	1917				

\* Additional sums were appropriated by the New York State Railways Co. and the Delaware, Lackawanna and Western Railroad Co.

† Additional sums were appropriated by the city of Syracuse and the New York State Railways Co.

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED  
JUNE 30, 1917 — (Continued)

*Construction of the Barge Canal*

Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
James Stewart & Co., Inc.....	April 15, 1910	Contract No. 39, Oswego canal — Three River Point to Fulton.....	\$972,900 00	\$1,032,561 20	\$953,694 90
Barnally & Ingersoll.....	Dec. 10, 1912	Contract No. 103, Oswego canal — Bridge at Phoenix.....	185,655 00	205,744 75	182,825 38
James McKinney & Son.....	Mar. 22, 1917	Contract No. 158, Erie canal — Barrel buoys and lamp posts.....	*3,852 00	*3,127 00	*3,127 00
Larkin & Saugster.....	Jan. 11, 1913	Contract C, Cayuga and Seneca canal — Locks, dam, etc., at Seneca Falls.....	1,140,872 50	1,195,407 20	1,101,719 73
Sherman-Stalker Co.....	Feb. 24, 1914	Contract D, Cayuga and Seneca canal — From Demont's bridge through Waterloo.....	1,308,765 00	1,059,553 00	944,063 92
Lupfer & Remick.....	Nov. 24, 1914	Contract G, Cayuga and Seneca canal — Lock-gates, etc., for locks Nos. 2, 3 and 4, needle-beam for dam No. 2, and Taintor gates at Waterloo.....	119,809 00	110,115 00	102,004 11

\* Figures include portion on Eastern Division.

*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Jackson L. Richmond *	Sept. 2, 1914	Water-supply — Highways adjacent to Hinckley reservoir.....	\$99,120 10	\$96,079 50	\$85,989 75

\* This contract was completed prior to July 1, 1916, but the final estimate was not available for last year's report.

*Construction of Barge Canal Terminals*  
Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Eastover Construction Co.	Jan. 8, 1913	Terminal contract No. 15 — Harbor, dock-wall, connecting channel, etc., adjacent to Barge canal at Utica.....	\$608,071 00	\$577,915 00	\$575,806 98
Scott Brothers	Aug. 31, 1915	Terminal contract No. 46 — Dockwall and approach, west of Weedsport bridge.....	16,331 00	13,653 00	11,456 87

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, JUNE 30, 1917  
*Special Work*

CONTRACTOR	Date of contract	Character of work	ACT		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
			Chap.	Year				
Walter S. Rae.....	Oct. 25, 1915	Continuing and completing construction of bridge over Black and Moose rivers at Lyons Falls, Lewis county.....	699	1915	*\$37,888.44	439,385.00	\$61,541.60	\$56,370.00
Larkin & Sangster.....	Sept. 12, 1916	For constructing portions of a bridge over the Owasego river at Minetto (Part of Barge canal contract No. 89).....	728	1915				
			646	1916				
			716	1915	50,000.00	44,088.15	42,988.15	16,080.00
			181	1917				
Z. T. Darrow & Son.....	Dec. 17, 1913	Repairing west pier at foot of Owaseco lake and dredging Owaseco outlet.....	654	1913	20,400.00	17,814.50	17,652.50	11,980.00
			728	1915				
			181	1917				

\* This figure includes \$37,888.44 reappropriated from unexpended balance from chapter 246, Laws of 1913, and a new appropriation of \$30,000.00.

*Construction of the Barge Canal*  
Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Grant Smith & Co. & Locher*	Feb. 24, 1913	Contract No. 42-A, Erie canal — Herkimer-Oneida county line to Oriskany road	\$1,033,037 85	\$1,239,045 03	\$1,139,680 00
The M. A. Talbott Co.	Oct. 15, 1909	Contract No. 43, Erie canal — Oriskany road to Mud creek	1,529,885 00	1,388,080 05	1,287,780 00
Scott Brothers	Oct. 10, 1916	Contract No. 44-A, Erie canal — Prism near junction lock at New London	57,050 00	52,486 00	36,140 00
James Stewart & Co., Inc.*	Sept. 2, 1914	Contract No. 46-A, Erie canal — Fox Ridge to Monteguma aqueduct	333,941 50	196,133 50	157,750 00
Scott Brothers*	Feb. 25, 1916	Contract No. 46-B, Erie canal — Lock, dam, etc., at May's Point	314,660 72	227,348 22	144,190 00
Alto Construction Co.	Dec. 23, 1910	Contract No. 51, Water-supply — Feeder from Trenton Falls on West Canada creek to Nine-Mile creek	424,710 00	414,809 85	353,780 00
Cheesley, Earl & Heimbaech, Inc.	Oct. 17, 1916	Contract No. 81, Erie canal — Junction lock at Rome	61,236 40	54,685 90	45,680 00
Larkin & Sangster	Sept. 12, 1916	Contract No. 99, Oswego canal — Bridge over Oswego river at Minetto	173,082 60	172,992 00	1330 00
Lupfer & Remick	Nov. 3, 1916	Contract No. 132, Erie canal — Lighthouses, range towers, beacons, etc.	63,937 00	70,330 20	40,270 00
H. S. Kerbaugh, Inc.	Nov. 3, 1916	Contract No. 139, Oswego canal — Lock No. 8 to deep water in Lake Ontario	25,280 00	25,912 00	17,130 00
R. B. Wing & Son	Feb. 28, 1917	Contract No. 153, Erie and Oswego canals — Buoy, stake and bridge lanterns on the Mohawk, Oneida, Seneca and Oswego rivers			
Thomas Bowen	April 20, 1917	Contract No. 157, Erie canal — Dam across old Erie canal at Rome	14,200 00	14,359 00	0 00
Sherman-Stalter Co.	July 24, 1916	Contract A-1, Cayuga and Seneca canal — Fish-ladder and repairs to dam No. 1	4,924 00	6,247 50	500 00
Stanley Construction Co.	July 20, 1914	Contract F, Cayuga and Seneca canal — Free, Demont's and Lake road bridges	29,019 30	26,842 50	24,140 00
Scott Brothers	Sept. 23, 1915	Contract L, Cayuga and Seneca canal — Bridges at Gorham street and Kingsford road	128,263 00	142,578 70	120,100 00
Lupfer and Remick	Nov. 5, 1914	Contract M, Cayuga and Seneca canal — Electrical and operating equipment for locks Nos. 1, 2, 3 and 4	71,469 25	59,928 40	53,010 00
The Foundation Co.	June 8, 1917	Contract P, Cayuga and Seneca canal — Concrete cut-off wall under lock No. 3	176,087 00	191,436 00	165,100 00
			70,412 50	82,850 00	0 00

\* Relat to complete former contracts.

† These figures do not include the portion of this contract under chapter 716, Laws of 1915. See "Special Work."

‡ Figures include portion in Eastern Division.

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, JUNE 30, 1917 — (Continued)  
Special Work Connected with Barge Canal Construction

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Harry A. Schaupp.....	Jan. 17, 1916	Eric canal — Connecting highways, Muck road to James street and Whitesboro street to Mill street, Rome....	\$23,634 55	\$32,111 50	\$20,130 00

Construction of Barge Canal Terminals  
Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
E. Brown Baker.....	June 4, 1917	Terminal contract No. 16-P — Paving terminal at Rome.	\$3,300 00	\$3,909 50	0 00
Walsh Construction Co., Inc.....	Nov. 4, 1915	Terminal contract No. 20 — Terminal basin with connecting channel to Onondaga lake at Syracuse.	665,875 00	566,753 25	\$377,880 00
Barrally & Ingersoll.....	Feb. 15, 1915	Terminal contract No. 28 — Harbor, dockwall and breakwaters on Oneida lake at Cleveland.	34,575 00	37,222 00	28,790 00
Barrally & Ingersoll.....	Nov. 27, 1914	Terminal contract No. 29 — Harbor, dockwall and breakwaters on Oneida lake at Constantia.	43,573 50	39,793 50	3,400 00
Henry P. Burgard.....	Mar. 24, 1916	Terminal contract No. 30 — Dockwall and approach on east side of Oswego river at Oswego.	103,700 00	106,583 10	71,700 00
H. S. Kerbaugh, Inc.....	July 10, 1914	Terminal contract No. 33 — Terminal pier, channels, etc., at the east end of West First street, Oswego.	415,420 00	351,175 50	\$322,940 00
E. Brown Baker.....	Dec. 18, 1916	Terminal contract No. 101 — Stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda.	*21,800 90	*31,790 90	0 00
William R. Kinney.....	Mar. 14, 1917	Terminal contract No. 205 — Temporary terminal warehouses at Utica and Rome.	2,320 00	13,906 75	12,830 00

\* Figures include portions in Eastern and Western Divisions.

MIDDLE DIVISION: CONSTRUCTION WORK BY YEARS 285

SUMMARY OF CONSTRUCTION WORK—BARGE CANAL—MIDDLE  
DIVISION

Value of work done under Barge canal contracts in the Middle Division, summarised  
by years and sections.

YEAR*	VALUE OF WORK DONE						
	Erie Canal				Oswego canal	Totals, Erie and Oswego canals	Cayuga and Seneca canal
	Section 5	Section 6	Section 7	Totals			
1906.....	\$41,180		\$11,390	\$52,570	\$2,230	\$54,790	
1907.....	123,900		104,920	228,820	69,010	297,830	
1908.....	253,450	\$170,050	156,867	580,367	173,030	753,397	
1909.....	476,680	718,290	336,610	1,530,410	324,060	1,854,470	
1910.....	743,740	280,122	370,680	1,394,542	529,890	1,924,432	
1911.....	1,179,323	573,220	609,680	2,362,223	1,075,556	3,437,779	\$432,060
1912.....	912,151	297,780	592,300	1,802,231	1,117,259	2,919,490	517,450
1913.....	1,113,044	228,904	240,887	1,682,835	1,427,058	3,109,893	865,810
1914.....	1,715,100	252,310	112,094	2,079,504	1,059,637	3,139,141	1,231,539
1915.....	856,029	180,991	109,398	1,146,418	552,925	1,699,343	1,365,450
1916.....	209,705	878	39,802	250,385	177,856	428,241	412,492
1917.....	284,520	38,868	263,060	586,448	56,340	642,788	167,091
Totals...	\$7,907,923	\$2,741,843	\$3,047,688	\$13,696,753	\$6,564,841	\$20,261,594	\$4,991,832

Extra Work Orders Paid

1907.....	\$1,257			\$1,257		\$1,257	
1908.....			\$50	50	\$1,198	1,248	
1909.....		\$329		329	761	1,090	
1910.....	11,522	867		12,389		12,389	
1911.....	3,353			3,353	2,135	5,488	
1912.....	2,175	724		2,899	1,702	4,602	
1913.....	7,530	1,261	2,310	11,101	8,415	19,516	\$3,065
1914.....	17,762	90	26	17,878	15,719	33,597	9,534
1915.....	9,925	623	886	11,434	4,130	15,564	2,926
1916.....	3,272	2,808	4,275	10,355	276	10,631	66,709
1917.....	2,690		1,024	3,714	10,217	13,931	8,845
Totals...	\$59,486	\$6,702	\$8,571	\$74,759	\$44,554	\$119,313	\$90,079

\* The years 1906 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.



**SUMMARY OF CONSTRUCTION WORK—BARGE CANAL TERMINALS  
— MIDDLE DIVISION**

**Value of work done under Barge canal terminal contracts in the Middle Division,  
summarised by years and sections**

YEAR *	VALUE OF WORK DONE						
	Erie Canal				Oswego canal	Cayuga and Seneca canal	Totals, Middle Division
	Section 5	Section 6	Section 7	Totals			
1913 .....	\$97,980	.....	.....	\$97,980	.....	\$23,870	\$121,850
1914 .....	338,440	.....	.....	338,440	\$1,520	16,666	356,626
1915 .....	194,325	.....	.....	194,325	139,170	.....	333,495
1916 .....	19,740	\$93,670	\$3,260	116,670	106,210	.....	224,880
1917 .....	34,867	316,400	8,107	349,464	155,740	.....	505,204
<b>Totals..</b>	<b>\$675,352</b>	<b>\$410,070</b>	<b>\$11,467</b>	<b>\$1,096,879</b>	<b>\$404,640</b>	<b>\$40,536</b>	<b>\$1,542,065</b>
<b>Extra Work Orders Paid</b>							
1916 .....	\$197	\$374	.....	\$471	.....	.....	\$471
1917 .....	8,195	1,140	.....	9,335	\$855	.....	7,190
<b>Totals..</b>	<b>\$1,392</b>	<b>\$1,414</b>	.....	<b>\$6,806</b>	<b>\$855</b>	.....	<b>\$7,661</b>

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, on to 1 June 30, and 1917 is a twelve-month period, on to 1 June 30.

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**REPORT**  
**OF THE**  
**DIVISION ENGINEER**  
**OF THE**  
**WESTERN DIVISION**  
**For the Fiscal Year Ended June 30, 1917**



## WESTERN DIVISION

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STATE OF NEW YORK

DEPARTMENT OF STATE ENGINEER AND SURVEYOR

WESTERN DIVISION

ROCHESTER, N. Y., *July 2, 1917.*

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany,*  
N. Y.:

Sir.—I have the honor of submitting herewith my report for the fiscal year ended June 30, 1917, as Division Engineer of the Western Division.

The work of the Division has consisted of conducting the engineering in connection with the 150 miles of canal, including construction, maps, descriptions and reports on appropriations, claims and complaints; also plans and estimates for the completion of canal construction. The division work has also included similar work in connection with river improvements at Hornell, Jamestown, Ellicott creek and other points. The surveying and mapping of the blue line have been continued. Certain maps on this Division have been approved by the Legislature, as follows: Sheets 501 to 522, inclusive, from the Wayne-Seneca county line to Lyons. Sheets 586 to 622, inclusive, from King's Bend west of Pittsford to the Barge canal junction at South Greece. Also seven sheets of the Genesee river feeder.

The forces are located as follows:

*Division Headquarters, Rochester.* General supervision; sections of canal not assigned, and Canisteo river improvement.

*Residency No. 8.* L. S. Hulburt, Senior Assistant Engineer, in charge, with headquarters at Lyons.

*Residency No. 9.* A. E. Steere, Senior Assistant Engineer, in charge, with headquarters at Rochester.

*Rochester Harbor.* A. R. Morse, Senior Assistant Engineer, in charge, with headquarters at Rochester.

*Western Residency.* B. E. Failing Senior Assistant Engineer, in charge, with headquarters at Buffalo. From Monroe-Orleans county line west (Residencies Nos. 10-A, 10-B and 11); Buffalo

Work on the Rochester harbor has been commenced and a section of the west wall in the vicinity of the Erie railroad has been placed and a drag-line has commenced excavating the river channel.

The railroad crossings in section No. 9 have so progressed that the incomplete work includes only the Erie railroad bridge east of the park, the Pennsylvania bridge west of the river at Genesee Valley park and a small amount of unfinished work on the terminal connection bridge two miles west of the river.

Contract No. 138, comprising the movable dam near Court street, Rochester, has been let during the year and construction work was started the past spring. At the time of this report a portion of the west bulkhead has been completed.

The work of constructing the Adams street bridge at Lockport has advanced and erection of the steelwork is in progress at the close of the year's report.

On contract No. 19-A the work has been confined largely to the reconstruction of the New Home bridge and the rebuilding of the highway at Cartersville, although preparations for placing the dredge on the south side are in progress.

At Tonawanda a contract has been let for the construction of a bascule bridge to replace the bridge washed away at Webster street. An agreement has been reached with the New York Central Railroad officials whereby they will eventually abandon their railroad crossing at Webster street, combining their track at this point with the Batavia branch in one crossing at the latter location. An agreement has also been reached with the Erie Railroad Company for underpinning its bridge across the creek at Tonawanda.

A contract has been prepared and is ready for advertising for completing the excavation in the vicinity of Tonawanda and the removal of the dam at that point.

The above paragraphs summarize the main features of Barge canal construction on this Division. Accounts of this work in greater detail and also of less important work are given in the reports of the various residencies.

Repeating a previous statement in order to emphasize the matter, I desire to say that all work necessary to open the Barge canal across the Western Division is already under contract or is planned to be placed under contract during the latter part of

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the summer, thus making provision for the opening of the canal through this Division at the opening of navigation in 1918. The question of the actual opening of the canal, however, rests with the contractors and their forces. As stated above, the work is considerably handicapped by the abnormal conditions of labor, material and plant, due to the war, and it is difficult to predict far ahead what conditions will arise in the labor situation or what progress will be made.

Work at the Lyons terminal has been continued, some difficulty being experienced on account of high water. The contract for the storehouse at the Newark terminal has been awarded and the Rochester terminal work is well advanced. Storehouses at Spencerport and Holley were completed during the year. Progress is being made in constructing the terminals at Albion, Medina, Middleport, Tonawanda and North Tonawanda, and storehouses will be completed at Albion, Medina, both Lockport terminals, Tonawanda and North Tonawanda during the summer and fall. In addition to the Erie basin terminal work, which has been continued, with one pier practically completed, the Ohio basin terminal has been let and the work is being advanced rapidly.

#### SPECIAL APPROPRIATIONS

##### *Canisteo River Improvement*

(Chapter 750, Laws of 1913; chapter 728, Laws of 1915)

Contractor, Eastover Construction Co., Inc., Utica, N. Y.

Date of contract, October 18, 1915.

Work commenced, June, 1916.

Engineer in charge, H. R. Topping, Junior Assistant Engineer.

Amount of appropriation .....	\$50,000 00
Engineer's preliminary estimate .....	40,480 00
Contractor's bid .....	38,543 50
Contractor's bid as modified by supplementary agree- ment .....	41,219 50
Final estimate, approved by the Canal Board May 9, 1917 .....	34,777 27

This contract provided for widening and deepening the Canisteo river channel near Canisteo and for constructing a concrete protection wall at Hornell. It was completed during this year.

A supplementary agreement, approved by the Canal Board April 12, 1917, providing wooden pile revetment in several places and some sheeting. The contract price was increased by the agreement \$2,676.00.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done to date	Per cent, final estimate of contract quantities
Coffer-dams, pumping, bailing and draining, lump sum	\$300	\$300	\$300	100.0	100.0
Clearing..... lump sum	\$200	\$190	\$200	95.0	100.0
Excavation..... cu. yds.	56,350	38,721	42,331	68.7	75.1
Sheeting..... ft. B. M.	10,000	10,000	10,000	100.0	100.0
Second-class concrete..... cu. yds.	2,200	2,155.5	2,155.5	98.0	98.0
Foundation piles..... lin. ft.	3,000	2,100	2,100	70.0	70.0
Third-class riprap..... cu. yds.	80	61	61	76.2	76.2
<i>Added by Supplementary Agreement</i>					
Wooden pile revetment..... lin. ft.	1,624	1,624	1,624	100.0	100.0
Sheeting..... ft. B. M.	8,000	7,652	7,652	95.6	95.6
Gross estimate at contract prices.....	\$41,219 50	\$33,287 17	\$34,777 27	80.8	84.4

*Chadakoin River or Chautauqua Lake Outlet Improvement, at Jamestown, Chautauqua County*

(Chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917)

Contractor, George L. Maltby, Jamestown, N. Y.

Date of contract, March 23, 1916.

Engineer in charge, C. R. DeGraff.

Amount of appropriation.....	\$100,000 00
Engineer's preliminary estimate.....	89,252 25
Contractor's bid .....	92,074 25

The work consists in cleaning out and deepening the channel under and in the vicinity of Windsor street bridge; dredging, widening or otherwise enlarging the channel from Wilson's dam to the plant of the Watson Manufacturing Company; erecting retaining walls on the north and south sides of the river in the vicinity of Institute street; erecting at the site of Warner's dam a new dam, with Taintor gates, to regulate the discharge from

Chautauqua lake; erecting head-gates at the entrance of the raceway on the north side of Warner's dam; straightening and dredging or otherwise enlarging the channel of the Chadakoin river between Warner's dam and Fairmont avenue in the city of Jamestown. Length is about 1.5 miles.

The work done during the year consisted in erecting the head-gates at the entrance of the raceway on the north side of Warner's dam, also in deepening and widening the Chadakoin river from the outlet of Chautauqua lake to the Erie railroad bridge. This excavation is being done by a floating plant, operating an orange-peel bucket. The material is loaded on scows and taken to the spoil-banks.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Coffer-dams, pumping, bailing and draining.....	lump sum \$4,000	\$1,000	25.0
Clearing.....	lump sum \$100	0	0.0
Excavation.....	cu. yds. 70,500	4,110	5.8
Embankment.....	cu. yds. 1,525	0	0.0
Sheeting and bracing.....	ft. B. M. 75,000	1,515	2.0
Sawed lumber.....	ft. B. M. 2,500	1,501	57.7
Foundation piles.....	lin. ft. 1,000	0	0.0
Wooden sheet-piling.....	ft. B. M. 20,500	1,008	4.9
Second-class concrete.....	cu. yds. 3,550	211	5.9
Second-class riprap.....	cu. yds. 450	0	0.0
Third-class riprap.....	cu. yds. 430	58	13.5
Structural steel.....	lbs. 110,000	0	0.0
Machinery.....	lbs. 17,000	0	0.0
Wrought-iron pipe railing.....	lin. ft. 85	0	0.0
Metal reinforcement.....	lbs. 5,500	557	10.1
Steel sheet-piling.....	sq. ft. 1,900	0	0.0
Gross estimate at contract prices.....	\$92,074 25	\$5,408 69	5.9

### *Sawyers Creek Improvement*

(Chapter 531, Laws of 1914; chapter 728, Laws of 1915)

Contractor, H. S. Kerbaugh, Inc., New York city.

Date of contract, September 27, 1915.

Engineer in charge, O. L. Burdett.

Amount of appropriation .....	\$10,000 00
Engineer's preliminary estimate.....	8,600 00
Contractor's bid .....	9,440 00
Final estimate, approved by the Canal Board August 31, 1916. ....	8,980 22



This contract provided for deepening Sawyers creek from a point 500 feet north of the New York Central railroad bridge to the intersection of Sawyers and Tonawanda creeks, and the placing of concrete protection over a section of 30-inch cast-iron pipe of the Lockport water main, which crosses the improvement. The length of the improvement is 1.2 miles.

The contract was finished during the previous year with the exception of trimming the spoil-banks, which was done this year.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	16,000	20	15,259	0.1	95.4
Second-class concrete.....cu. yds.	10	0	7	0.0	70.0
Trimming spoil-banks.....hump sum	\$60	\$60	\$60	100.0	100.0
Gross estimate at contract prices.....	\$9,440 00	\$71 60	\$8,980 22	0.8	95.1

#### *Ellicott Creek Improvement*

(Chapter 624, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917)

On June 20, 1916, the contract for improving Ellicott creek was canceled. F. L. Cohen, of Buffalo, N. Y., was the contractor.

Considerable field and office work has been done on this contract during the year in preparing it for reletting.

#### BLUE LINE SURVEYS

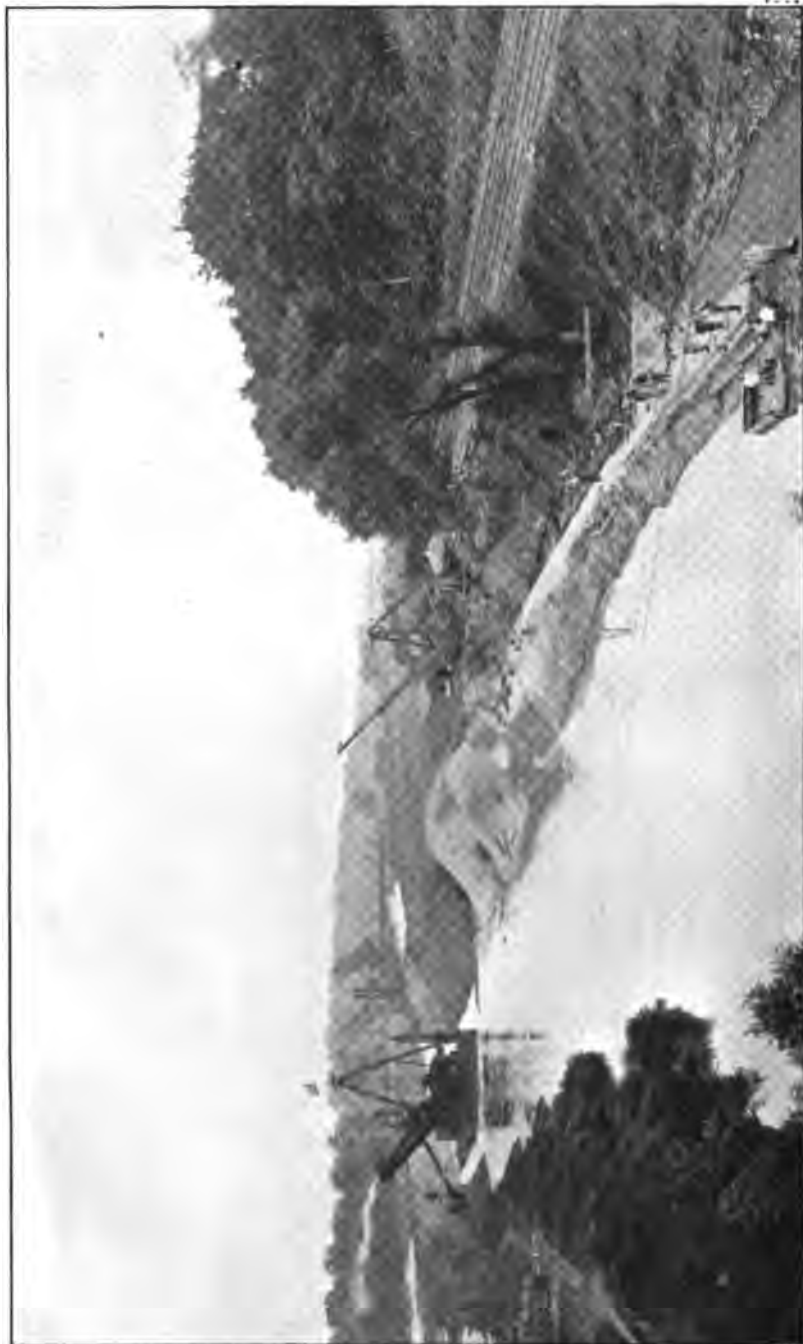
Between Buffalo and the city of Tonawanda blue line surveys have been made and part of this stretch has been mapped.

#### COURT OF CLAIMS SURVEYS

A large amount of time has been given to work connected with the Court of Claims by survey parties, draftsmen and engineers, who have been called as witnesses.

#### GRANTS OF LANDS UNDER WATER

In the cities of Buffalo and Tonawanda several applications have been made to the State for grants of lands under water—along the lake shore in the city of Buffalo and along the Niagara river in the cities of Tonawanda and North Tonawanda.



**BARGE CANAL, CONTRACT NO. 47-A**  
Work on the Clyde river below Lyons. A view showing dredges at work, dikes and concrete retaining wall construction.

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Surveys have been made of these lands, which cover about four miles of water front. Maps have been made covering lands requested by five applicants.

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ERIE CANAL, RESIDENCY No. 8.

Senior Assistant Engineer L. S. Hulburd reports:

*Contract No. 47-A*

This contract is for completing the construction of the canal from the town line about five miles southeast of the village of Clyde to a point near the New York Central railroad crossing at Lyons. Length, 14.46 miles. It was awarded to the Central Dredging Co., of Cleveland, Ohio, being signed on March 22, 1916. Work was started June 5, 1916. The engineer's preliminary estimate was \$1,038,469.00, the contractor's bid, \$726,034.30.

F. W. Madigan, Assistant Engineer, is in charge.

The hydraulic dredge *Hudson* was started on July 9, 1916, about four miles east of Lyons and continued working westerly for about one and one-half miles, shutting down for the winter on November 18. The dipper dredge worked from August until December, excavating in the channel at Clyde village. At the west end of the contract a steam-shovel and drag-line excavator were in operation and removed 203,000 cubic yards.

The retaining wall east of the West Shore railroad bridge below Lyons was started and about 158 linear feet completed. This work and the steam-shovel and drag-line excavator work were done by Lathrop, Shea & Henwood, as subcontractors.

On March 21, 1917, the Canal Board suspended the contract with the Central Dredging Co., because the work had not progressed satisfactorily, and on March 27, the Superintendent of Public Works proceeded to complete the work, employing the Sherman-Stalter Co. with its plant and force for the purpose.

The dredging plant of the Sherman-Stalter Co., consisting of two hydraulic dredges and one dipper-dredge, with scows, derrick-boat, etc., was brought over from the Cayuga and Seneca canal. The first dredge was in operation by April 22 and the other two soon after. A large part of the levee construction for the whole

contract has been done, a coffer-dam has been started for the Taintor gate at lock No. 26, timber cribs are under construction for the upper approach to this lock and drilling with well drills and drill-boat and blasting the hard material are in progress.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year †	Total work done to date †	Per cent of work done during year	Per cent of work done to date
Clearing.....	lump sum \$1,000	\$333 33	\$333 33	33.3	33.3
Excavation.....	cu. yds. 1,964,500	547,292	550,740	29.4	29.5
Forming embankment.....	cu. yds. *400	330	330	82.5	82.5
Sheeting and bracing.....	ft. B. M. 103,000	0	0	0.0	0.0
Sawed lumber, hemlock.....	ft. B. M. 32,300	0	0	0.0	0.0
Sawed lumber, white oak.....	ft. B. M. 1,200	0	0	0.0	0.0
Sawed lumber, yellow pine.....	ft. B. M. 18,000	16,300	16,300	90.6	90.6
Lining.....	cu. yds. 1,330	879	879	66.0	66.0
Round timber in cribs.....	lin. ft. 320	0	0	0.0	0.0
Stone filling in cribs.....	cu. yds. 410	0	0	0.0	0.0
Second-class concrete.....	cu. yds. 7,240	939	939	12.9	12.9
Removing concrete.....	cu. ft. 7,100	0	0	0.0	0.0
Steel sheet-piling, first quality.....	sq. ft. 10,500	139	139	1.3	1.3
Steel sheet-piling, second quality.....	sq. ft. 28,900	0	0	0.0	0.0
Second-class riprap.....	cu. yds. 840	0	0	0.0	0.0
Foundation piles.....	lin. ft. 19,900	0	0	0.0	0.0
Structural steel.....	lbs. 5,200	0	0	0.0	0.0
Metal reinforcement.....	lbs. 100	0	0	0.0	0.0
Iron castings, plain.....	lbs. 1,850	0	0	0.0	0.0
Metal in Taintor gates.....	lbs. 87,200	0	0	0.0	0.0
Wooden fence.....	lin. ft. 880	715	715	81.3	81.3
Maintaining highway traffic.....	lump sum \$100	\$80	\$80	80.0	80.0
Removing bridge floor.....	lump sum \$75	\$60	\$60	80.0	80.0
Repairs to upper lock-gates.....	lump sum \$2,500	\$2,500	\$2,500	100.0	100.0
Coffer-dams, pumping, bailing and draining, lump sum	\$3,840	\$268 80	\$268 80	7.0	7.0
Gross estimate at contract prices.....	*\$726,061 30	\$192,590 77	\$193,725 16	26.5	26.7

\* Figures given include an excess quantity authorized by the Canal Board, as follows:

Forming embankment, 180 cu. yds., by resolution dated December 13, 1916.

† This quantity at the contract price amounts to \$27.00.

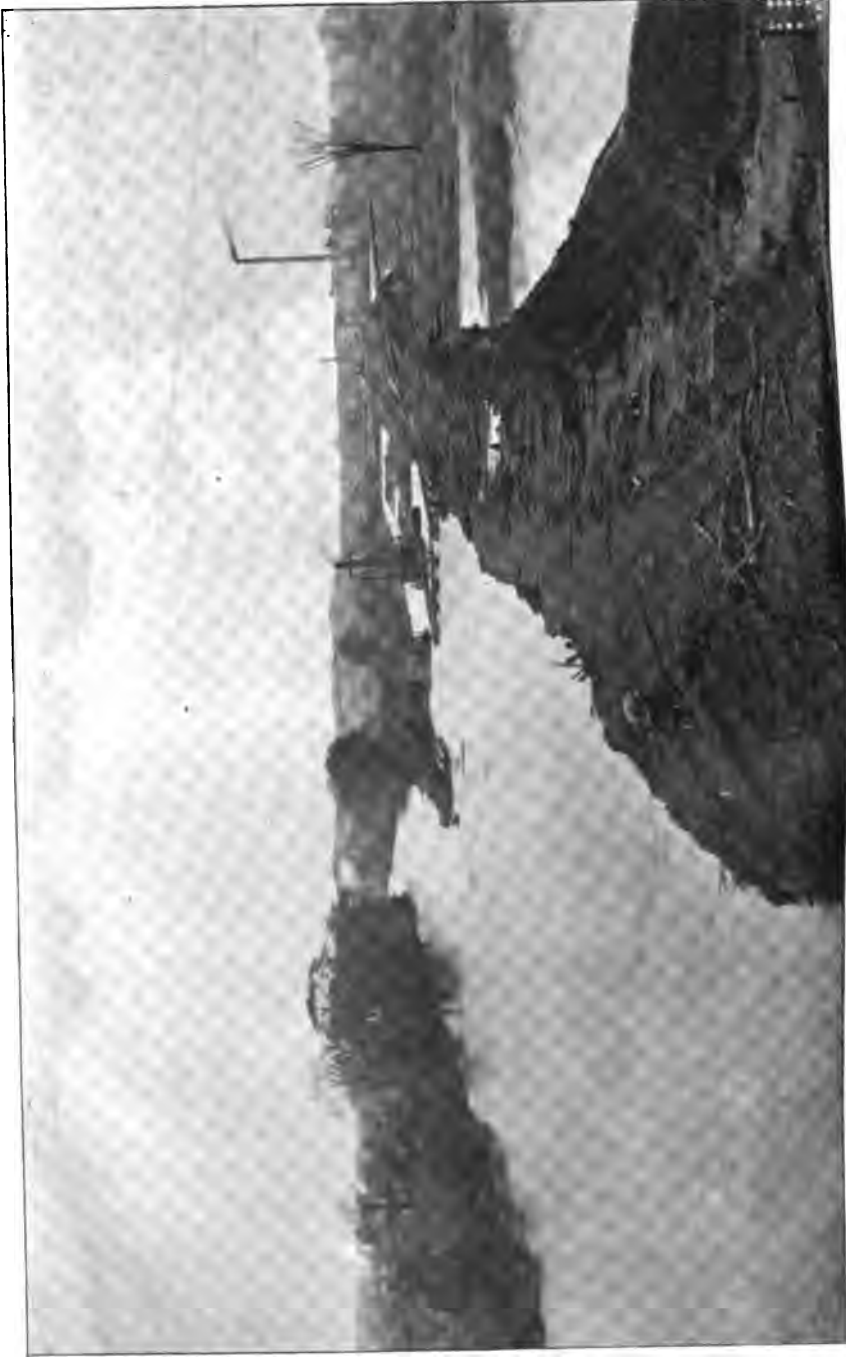
† This contract was canceled by the Canal Board, March 22, 1917. Figures given in these columns do not include work done by the Superintendent of Public Works.

### Contract No. 84

This contract provides for constructing portions of a viaduct over the Clyde river and railroad tracks at Clyde. It was awarded to Lupfer & Remick, of Buffalo, N. Y., being signed on March 9, 1917. Work was started March 2, 1917. The engineer's preliminary estimate was \$83,984.50, the contractor's bid, \$80,661.80. The contract price as modified by alterations Nos. 1 and 2 is \$83,876.66.

J. A. Sloat, Junior Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board June 6, 1917, provides a new approach from Orchard street to Mill street and



BARGE CANAL, CONTRACT NO. 47-A

A view looking west towards Lyons and showing the Clyde river on the left and the new canal channel on the right, in which a hydraulic dredge is seen operating. In the distance appears the bridge by which N. Y. C. main line crosses the canal.



eliminates the approach from Water street to Mill street. It decreases the amount of the contract price by \$826.36.

Alteration No. 2, approved by the Canal Board June 27, 1917, provides for constructing a retaining wall for the east side of the north approach. This alteration increases the amount of the contract price by \$4,041.22.

Three of the four river piers were built in the spring of 1917, before the gates of lock No. 26 were closed, advantage being taken of the low water in the river. Steel sheeting was driven around one of the piers and an open cut used for the other two. The concrete work in the south abutment was completed and preparations were made for the construction of the north abutment.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alterations	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	14,130	774	54.8
Excavation for piers.....cu. yds.	870	290	33.3
Sheeting and bracing.....ft. B. M.	7,300	0	0.0
Forming embankment.....cu. yds.	13,183	618	46.9
Lining.....cu. yds.	783	12	1.6
Foundation piles.....lin. ft.	6,060	0	0.0
Second-class concrete.....cu. yds.	1,788	845	47.3
Second-class concrete in piers.....cu. yds.	778	427	55.1
First-class reinforced concrete.....cu. yds.	235	0	0.0
Cast-iron pipe.....lbs.	59,600	7,797	13.1
8-in. v-trifled pipe and specials.....lin. ft.	150	0	0.0
Structural steel.....lbs.	396,000	864	0.2
Metal reinforcement.....lbs.	32,200	0	0.0
Concrete curbing.....lin. ft.	526	0	0.0
Concrete gutter.....sq. yds.	50	0	0.0
Water-bound macadam, 9 inches thick.....sq. yds.	979	0	0.0
Water-bound macadam, 6 inches thick.....sq. yds.	235	0	0.0
Brick pavement.....sq. yds.	610	0	0.0
Wooden fence.....lin. ft.	178	0	0.0
Lattice railing.....lin. ft.	982	0	0.0
Channel lamps.....No.	6	0	0.0
Catch-basins.....No.	3	0	0.0
Maintaining navigation.....lump sum	\$120	0	0.0
Deduct for bridge superstructure.....lump sum	\$600	0	0.0
Removing existing buildings.....lump sum	\$10	0	0.0
Gross estimate at contract prices.....	\$83,876 66	\$17,523 02	20.9

#### Contract No. 154

This contract is for constructing an additional Taintor gate in the dam at lock No. 27, Lyons. It was awarded to Lupfer & Remick, of Buffalo, N. Y., being signed on April 7, 1917. Work was started May 1, 1917. The engineer's preliminary estimate was \$7,802.70, the contractor's bid, \$8,582.50.



F. W. Madigan, Assistant Engineer, is in charge.

Steel sheeting was driven around the west end of the pier above the spillway and the foundation was placed. Below the spillway the timber forms were built to fit the old concrete and preparations were made for placing the concrete.

*Contract No. 159*

This contract provides for placing embankment on the north canal bank between Newark and Palmyra and extending the Ganargua creek spillway. It was awarded to I. M. Ludington's Sons, Inc., of Rochester, N. Y., being signed on March 27, 1917. Work was started April 9, 1917. The engineer's preliminary estimate was \$30,464.00, the contractor's bid, \$28,476.00.

R. W. Cady, Assistant Engineer, is in charge.

A line of wooden sheeting was driven along the canal side of the new spillway site for a coffer-dam and excavation was made for the apron and spillway, using horses and scrapers. The driving of the steel sheeting for the spillway was begun.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Spillway excavation..... cu. yds.	5,800	2,854	49.2
Embankment..... cu. yds.	4,860	629	12.9
Lining..... cu. yds.	10	0	0.0
Wooden sheet-piling..... ft. B. M.	10,000	0	0.0
First-class steel sheet-piling..... sq. ft.	11,000	3,112	28.3
Second-class concrete..... cu. yds.	138	0	0.0
Relaying wash wall..... cu. yds.	150	65	43.3
Second-class stone paving..... sq. yds.	35	0	0.0
Third-class riprap..... cu. yds.	2,000	60	3.0
Metal reinforcement..... lbs.	3,100	0	0.0
Sawing off existing wooden sheet-piling..... lump sum	\$25	0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$400	0	0.0
Gross estimate at contract prices.....	\$28,476 00	\$6,233 50	21.9

*Contract No. 141*

This contract is for constructing a new power-house and incidental work at lock No. 29, Palmyra. It was awarded to W. F. Maas & Son, being signed on March 8, 1917. Work was started April 2, 1917. The engineer's preliminary estimate was \$41,166.50, the contractor's bid, \$41,180.75.

R. W. Cady, Assistant Engineer, is in charge.

The contractors moved their plant to the site and excavated for the two upper wing-walls of the power-house. The old power-house was wrecked by dynamiting.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation..... cu. yds.	4,600	277	6.0
Sheeting and bracing..... ft. B. M.	26,000	0	0.0
Embankment..... cu. yds.	3,500	0	0.0
Lining..... cu. yds.	5	0	0.0
Foundation piles..... lin. ft.	2,870	1,520	53.0
Steel sheet-piling..... sq. ft.	2,980	2,000	67.0
Second-class concrete..... cu. yds.	2,100	0	0.1
First-class reinforced concrete..... cu. yds.	195	0	0.0
Structural steel..... lbs.	18,500	0	0.0
Metal bar reinforcement..... lbs.	11,400	0	0.0
Wire mesh reinforcement..... lbs.	5,450	0	0.0
Conductors..... lbs.	1,950	0	0.0
Metal duct..... lbs.	1,090	0	0.0
Fiber duct..... lin. ft.	150	0	0.0
Painting concrete..... cu. yds.	210	0	0.0
Wrecking substructure and superstructure of existing power station..... lump sum	\$2,000	\$500	25.0
Installing power stat on equipment now on site of contract..... lump sum	\$840	0	0.0
Furnishing and installing missing or broken equipment..... lbs.	800	0	0.0
Electrical connections..... lump sum	\$180	0	0.0
Tile roofing, removed and relaid..... square	14	0	0.0
Tile roofing, furnished and laid..... square	5	0	0.0
Concrete pole, complete..... lump sum	\$100	0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$1,200	0	0.0
Gross estimate at contract prices.....	\$41,180 75	\$4,832 65	11.7

### Construction Work:—Barge Canal

The Barge canal work done on section 8 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE							
	Contract No. 47	Contract No. 47-A	Contract No. 47-A (special agreement) †	Contract No. 48	Contract No. 49	Contract No. 76	Contract No. 77	Contract No. 84
1909.....	\$118,500	.....	.....	.....	.....	.....	.....	.....
1910.....	435,150	.....	.....	.....	\$30,470	.....	.....	.....
1911.....	166,940	.....	.....	\$75,970	240,250	\$353,260	\$412,600	.....
1912.....	110,260	.....	.....	759,170	272,930	437,610	761,670	.....
1913.....	.....	.....	.....	396,770	100,490	576,600	385,750	.....
1914.....	.....	.....	.....	234,810	41,470	11,290	79,945	.....
1915.....	.....	.....	.....	6,211	958	.....	.....	.....
1916.....	.....	\$1,130	.....	.....	.....	.....	.....	.....
1917.....	.....	192,590	\$207,567	.....	.....	.....	.....	\$17,520
Totals.....	\$830,850	\$193,720	\$207,567	\$1,472,931	\$686,603	\$1,378,760	\$1,641,965	\$17,520
<i>Extra Work Orders Paid, 1920-1917, Inclusive</i>								
1912.....	\$1,654	.....	.....	\$2,889	.....	\$1,650	\$627	.....
1913.....	933	.....	.....	3,273	\$5,839	9,957	4,164	.....
1914.....	.....	.....	.....	3,783	97,894	10,743	44,710	.....
1915.....	.....	.....	.....	123	7,203	.....	.....	.....
Totals.....	\$2,592	.....	.....	\$10,019	\$110,934	\$22,350	\$49,501	.....

YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 89	Contract No. 94 (section 8)	Contract No. 106 (section 8)	Contract No. 108	Contract No. 141	Contract No. 159	
1909.....	.....	.....	.....	.....	.....	.....	\$118,500
1910.....	.....	.....	.....	.....	.....	.....	465,620
1911.....	.....	.....	.....	.....	.....	.....	1,249,020
1912.....	.....	.....	.....	.....	.....	.....	2,343,600
1913.....	\$18,030	\$18,550	.....	.....	.....	.....	1,406,780
1914.....	35,970	198,030	.....	\$81,150	.....	.....	682,665
1915.....	1,546	42,635	\$300	2,649	.....	.....	54,199
1916.....	.....	.....	.....	.....	.....	.....	1,120
1917.....	.....	.....	.....	.....	\$4,830	\$6,230	428,787
Totals.....	\$56,146	\$259,215	\$300	\$83,799	\$4,830	\$6,230	\$6,840,341
<i>Extra Work Orders Paid, 1909-1917, Inclusive</i>							
1912.....	.....	.....	.....	.....	.....	.....	\$6,820
1913.....	.....	.....	.....	.....	.....	.....	24,171
1914.....	.....	.....	.....	.....	.....	.....	157,130
1915.....	\$59	\$1,922	.....	\$400	.....	.....	9,707
Totals.....	\$59	\$1,922	.....	\$400	.....	.....	\$197,828

\* The years 1909 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period ended June 30; and 1917 is a twelve-month period, ended June 30.

† This agreement is for completing the work on contract No. 47-A, which was canceled.

NOTE.—No extra work orders were paid on this section during 1909, 1910, 1911, 1916 and 1917.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 94, sections 9 and 10, Erie canal; contract No. 106, sections 9 and 10, Erie.

### *Terminal Contract No. 31 — Lyons*

This contract provides for constructing a dockwall and an approach at Lyons. It was awarded to Lupfer & Remick, of Buffalo, N. Y., being signed on September 30, 1916. Work was started September 27, 1916. The engineer's preliminary estimate was \$57,925.00, the contractor's bid, \$51,653.80.

F. W. Madigan, Assistant Engineer, is in charge.

Beginning at the west end of the wall, the contractors have built 170 feet of the terminal wall, enclosing one forty-foot section at a time with steel sheeting.



**BARGE CANAL, TERMINAL CONTRACT NO. 211 — NEWARK**

**Frame warehouse at the Newark terminal.**

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The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing..... hump sum	\$25	0	0.0
Coffer-dams, pumping, bailing and draining..... hump sum	\$27,000	\$10,125	37.5
Excavation..... cu. yds.	15,400	1,135	73.7
Forming embankment..... cu. yds.	10,400	400	3.8
Sawed lumber..... ft. B. M.	6,200	200	3.2
Wooden fence..... lin. ft.	500	0	0.0
Second-class concrete..... cu. yds.	2,800	836	29.9
Cast-iron pipe..... lbs.	1,620	1,545	95.4
4-in. drain tile..... lin. ft.	1,220	0	0.0
Structural steel..... lbs.	220	0	0.0
Iron castings, plain..... lbs.	4,100	1,710	41.7
Malleable cast-iron nosing..... lin. ft.	500	167	33.4
Fender fastenings..... No.	82	0	0.0
Metal curb protection..... lin. ft.	70	0	0.0
Gravel surfacing..... cu. yds.	650	0	0.0
1-in. wrought-iron pipe railing, galvanized..... lin. ft.	500	0	0.0
Gross estimate at contract prices.....	\$51,653 80	\$16,506 00	32.0

*Terminal Contract No. 211.*

This contract provides for constructing terminal warehouses at Newark, Albion and Medina. The only work within this residency is the warehouse at Newark. The contract was awarded to W. F. Martens & Co., Inc., of Rochester, N. Y., being signed on June 14, 1917. The engineer's preliminary estimate for the Newark warehouse was \$3,000.00, and the contractor's bid, \$2,765.00.

Work on this warehouse has not yet begun.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Newark</i>			
Excavation..... cu. yds.	25	0	0.0
Second-class concrete..... cu. yds.	30	0	0.0
Iron and steel fastenings..... lbs.	220	0	0.0
Painting..... hump sum	\$115	0	0.0
Carpenter work..... hump sum	\$2,183	0	0.0
Electric work..... hump sum	\$150	0	0.0
Total for Newark.....	\$2,765 00	0	0.0

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Albion</i>			
Excavation.....	25 cu. yds.	24	96.0
Second-class concrete.....	28 cu. yds.	24.6	87.9
Iron and steel fastenings.....	290 lbs.	130	65.0
Painting.....	\$115 lump sum	0	0.0
Carpenter work.....	\$1,970 lump sum	0	0.0
Electric work.....	\$90 lump sum	0	0.0
Total for Albion.....	\$2,472 00	\$258 40	10.4
<i>Warehouse at Medina</i>			
Excavation.....	25 cu. yds.	20	80.0
Second-class concrete.....	30 cu. yds.	26.4	88.0
Iron and steel fastenings.....	220 lbs.	203	92.3
Painting.....	\$115 lump sum	0	0.0
Carpenter work.....	\$2,183 lump sum	\$1,746 40	80.0
Electric work.....	\$150 lump sum	0	0.0
Total for Medina.....	\$2,765 00	\$2,024 30	73.2
<i>Summary of Contract</i>			
Warehouse at Newark.....	\$2,765 00	0	0.0
Warehouse at Albion.....	2,472 00	\$258 40	10.4
Warehouse at Medina.....	2,765 00	2,024 30	73.2
Gross estimate at contract prices.....	\$8,002 00	\$2,282 70	28.5

### *Construction Work — Barge Canal Terminals*

The Barge canal terminal work done on section 8 has all been done during the year ended June 30, 1917, as follows:

Under terminal contract No. 31, \$16,500; under terminal contract No. 211, section 8, \$260; total \$16,760.

NOTE.—No extra work orders have been paid on this section.

Under terminal contract No. 211 work has also been done on section 10, Erie canal.

### *Railroad Crossings*

The New York Central Railroad Co. has continued its work of providing necessary clearance and underpinning the substructures at the following bridges over the canal, the Walsh Construction Co. being the contractor:

The West Shore railroad bridge (Y connection) east of Lyons has been raised 2.9 feet and the approaches raised for a long distance at both ends of the bridge. The masonry of the two center piers has been carried down below canal grade and the work of constructing a concrete cut-off in front of the south abutment is in progress.



**BARGE CANAL, CONTRACT NO. 63-A**

**Laying concrete bottom near the Auburn branch railroad crossing. There appear also a guard-gate, the new railroad bridge and embankment and in the distance the village of Pittsford.**





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The West Shore railroad bridge one mile east of Lyons has been underpinned by extending the foundation of the two piers below canal grade.

At the crossing of the main line of the New York Central over the Barge canal east of Lyons the north halves of the two abutments were built during 1916 and the traffic has been diverted over them. The excavation has been nearly completed for the remainder of the masonry.

At the New York Central main line bridge east of Newark the abutments have been supported by concrete carried below canal grade. The method employed was to excavate short alternate sections about six feet long, which were filled with concrete, and later the space between these piers was excavated and filled in a similar manner.

At the West Shore railroad bridge east of Newark the abutments have been extended below canal grade and the superstructure raised 0.46 foot.

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#### ERIE CANAL, RESIDENCY No. 9

Senior Assistant Engineer A. E. Steere reports:

The portion of residency No. 9 under my supervision comprises contracts Nos. 63-A, 23-A and 21-A, for completing the Barge canal prism in the vicinity of Rochester; contract No. 162, for constructing a drain across the canal at Brockport; and terminal contract No. 206, for constructing temporary terminal warehouses at Spencerport and Holley.

#### *Contract No. 63-A*

This contract provides for completing the construction of the canal from the west line of Wayne county to the east end of contract No. 23-A at King's Bend. Length, 12.22 miles. It was awarded to the State Highway Construction Company of Beacon, N. Y., being signed on February 23, 1916. Construction work began on April 6, 1916. The engineer's preliminary estimate was \$567,745.70, the contractor's bid \$488,103.20. The contract price as modified by alteration No. 1 is \$500,603.20.

D. E. Bellows, Assistant Engineer, is in charge.

The contract has been modified by alteration No. 1, which provides for payment for additional work in connection with the completion of culvert No. 30. This alteration increased the contract price by \$12,500.00.

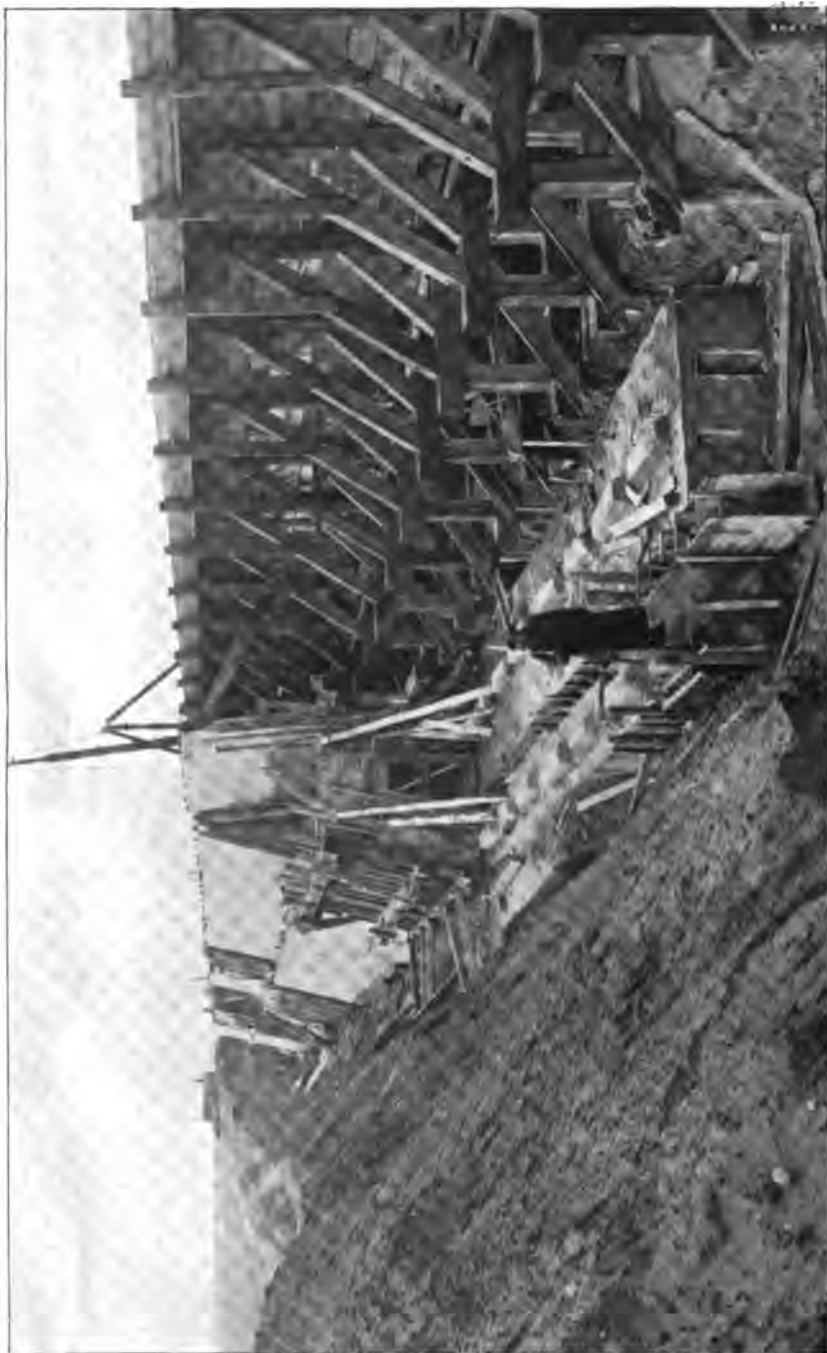
The south bank of the canal at the east end of the contract was strengthened by driving 7,860 sq. ft. of steel sheet-piling and placing 1,201 cu. yds. of second-class embankment. A pile-driver was used and the embankment was made with teams and slip-scrapers.

Excavation for the prism at Fairport, between Stas. 1884 and 1911, was substantially completed by steam-shovel, and disposal was made by narrow-gage construction trains. The material was deposited in spoil on the Shummers bank. The excavation for the wash-wall notch between the above-mentioned stations remains to be made.

At Bushnell's Basin, Sta. 2094, the waste-gate outlet ditch was excavated and lined with concrete. The plant used consisted of portable concrete mixer, wheelbarrows and slip-scrapers.

At the Irondequoit creek crossing, embankment was placed to within about five feet of the final elevation, as called for on the plans on the north side, and to about canal grade on the south side. The foundation for a portion of the trough walls on the north side was placed. The highway on the north side of the embankment was finished. Under alteration No. 1 old culvert No. 30 was filled. The unfinished slopes were trimmed and the embankment regraded. The temporary bridge at the north end of culvert No. 30 was removed. Steam-shovel and construction trains were used on excavation and embankment work. For the concrete work the mixer at the west end of the flume was used and the concrete was transported by construction trains and deposited by means of chutes.

The new south bank of the canal across the Cartersville widewaters was completed with material excavated from borrow-pits by steam-shovel and construction trains. The tow-path of the old Erie canal at the east end of the widewaters was excavated by a derrick equipped with clam-shell and by teams with slip-scrapers. The tow-path at the west end of the widewaters was excavated by an Erie shovel and teams with slip-scrapers. A portion of the material excavated by the shovel was deposited in spoil along the



**BARGE CANAL, CONTRACT NO. 63-A**

**Building the new wall of the Irondequoit concrete trough without disturbing the temporary wooden flume which carried the canal while repairs were being made. The inspection tunnel with a drainage tunnel at its base is shown.**

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north bank by Koppel cars, drawn up the incline by a hoisting engine. The prism at the east end of the widewaters was concreted by a portable mixer, except the north slope, which was concreted by the central mixing plant, material being delivered by construction trains. The north slope between Cartersville bridge and the guard-gate was covered with concrete from the central mixing plant, the material being delivered by construction trains. The remainder of the concrete lining at the westerly end was deposited by two portable mixers, except the portion of the south bank and the bottom between the Cartersville bridge and the guard-gate.

Excavation for the completed prism, with the exception of the wash-wall notch, was made west of Pittsford, Sta. 2256 to Sta. 2276 + 25. The material was spoiled along the north bank of the canal. The plant used consisted of a Bucyrus shovel, locomotive and Western dump-cars of 4 cu. yds. capacity.

In order to secure a navigable channel of sufficient width to pass boats it was necessary to excavate a point under the crossing of the Auburn branch of the New York Central railroad. This work was performed with slip-scrapers and an Erie shovel prior to the navigation season of 1917, under an extra work order dated April 2, 1917. This work was performed at a cost of \$5,270.26.

On the night of May 14, 1917, the new south bank across the Cartersville widewaters gave way, causing the flooding of the space between this dike and the south bank of the old canal. Under an extra work order dated May 26, 1917, steps were taken to repair this break. Considerable seepage passed under the old canal bank and appeared in the fields to the south. In order to prevent a possible break of this old bank it was decided to fill the widewaters. This work was started by the small Erie shovel and teams, and later by the Bucyrus shovel and four construction trains, drawing eight 4-yard Western dump-cars. A tug and two bottom-dump scows, obtained from the Department of Public Works, were used in depositing material in the vicinity of the breach in the bank.

A leak developed at the toe of the north bank between Stas. 2149 and 2156 and flooded adjacent farm lands. In order to meet this situation it was decided to lay a 15-inch vitrified drain

tile from the Marsh road across the spillway channel to and along the toe of the south fill. This drain was practically completed to the first catch-basin along Marsh road, preparatory to draining the flooded land at the close of this fiscal year.

The work done on this extra work order up to July 1, 1917, consists in 22,000 cu. yds. of excavation placed as fill in the widewaters and 840 lin. ft. of 15-in. vitrified tile drain laid along Marsh road, at a cost of \$30,693.49. Of this amount, \$6,823.07 has been paid.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Coffer-dams, pumping, bailing and draining..... lump sum	\$5,000	\$2,000	\$2,000	40.0	40.0
Excavation..... cu. yds.	549,060	228,834	285,524	41.7	52.0
Forming embankment, first-class, cu. yds.	*102,000	56,345	56,345	55.2	55.2
Forming embankment, second-class, cu. yds.	99,200	32,557	82,100	32.8	82.7
Lining..... cu. yds.	960	0	29	0.0	3.0
Second-class concrete..... cu. yds.	33,010	19,051	19,051	57.7	57.7
Wash wall..... cu. yds.	12,900	0	0	0.0	0.0
Third-class stone paving..... sq. yds.	490	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	7,300	0	117	0.0	1.6
Cast-iron culvert pipe and specials..... lbs.	33,600	12,000	12,000	35.7	35.7
Structural steel..... lbs.	2,940	0	0	0.0	0.0
Metal reinforcements..... lbs.	74,200	0	0	0.0	0.0
Wooden fence..... lin. ft.	3,550	693	693	19.5	19.5
Steel sheet-piling..... sq. ft.	18,500	7,860	16,472	42.5	89.0
Sluice-gate, 12-in. in diameter..... No.	1	0	0	0.0	0.0
Tar-felt waterproofing..... sq. ft.	60,400	0	0	0.0	0.0
Lead seal plates..... lbs.	12,500	2,241	2,241	17.9	17.9
Screened gravel..... cu. yds.	1,800	0	0	0.0	0.0
Four-inch drain tile..... lin. ft.	3,000	0	0	0.0	0.0
Excavating concrete..... cu. yds.	2,800	50	50	1.8	1.8
Pulling piles..... No.	630	0	0	0.0	0.0
Removing timber flume..... lump sum	\$100	0	0	0.0	0.0
Removing bridge superstructure, lump sum	\$50	\$50	\$50	100.0	100.0
Removing and storing riprap..... cu. yds.	6,500	5,878	5,878	90.4	90.4
Maintaining navigation..... lump sum	\$1,000	\$250	\$250	25.0	25.0
Increased cost of completing work at culvert No. 80, not covered by contract plans..... lump sum	\$12,500	\$12,250	\$12,250	98.0	98.0
Gross estimate at contract prices.....	*\$516,603.20	\$228,720.28	\$262,527.96	44.3	50.8
<i>Extra Work Orders</i>					
April 2, 1917..... cost plus 15 per cent and cost plus 10 per cent					
May 26, 1917..... cost plus 15 per cent and cost plus 10 per cent			\$6,823.07		
Total.....			\$6,823.07		

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
Forming embankment, first-class, 61,000 cu. yds., by resolution dated Oct. 26, 1916.  
This quantity at the contract price amounts to \$16,000.00.



BARGE CANAL, CONTRACT NO. 21-A

Completing the rock cut southwest of Rochester. Crossing the canal in the distance are the bridge for the N. Y. C. main line and a highway bridge.



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*Contract No. 23-A*

This contract provides for completing the construction of the canal from King's Bend to the Lehigh Valley railroad crossing about one-half mile east of the Genesee river. Length, 5.13 miles. It was awarded to H. S. Kerbaugh, Inc., of Buffalo, N. Y., being signed on May 20, 1916. Construction work began on July 8, 1916. The engineer's preliminary estimate was \$651,703.10, the contractor's bid, \$630,568.42. The contract price as modified by alteration No. 1 is \$627,568.42.

C. L. Baldwin, Assistant Engineer, is in charge.

This contract has been modified by alteration No. 1, which provides for the use of second-quality steel sheet-piling. It decreased the contract price by \$3,000.00.

Excavation for the prism was begun during the first part of July, 1916. One steam-shovel with a narrow-gage equipment worked from July 14, 1916, to February 8, 1917, and from April 30, 1917, to July 1, 1917, between the East and West Henrietta road bridges and the west end of the contract, removing most of the material on the north side above the berme at elevation 518, and some on the north side below the berme. A portion of this material was placed in embankment in the vicinity of lock No. 33, the remainder being placed in spoil-banks west of the South avenue and Clinton avenue bridges.

A second steam-shovel was performing prism excavation between the East and West Henrietta road bridges from July 8, 1916, to Jan. 17, 1917, and from April 25, 1917, to July 1, 1917. The material was transported by means of narrow- and standard-gage rolling-stock. A part was deposited as embankment west of lock No. 33 and the remainder placed in spoil along the south bank.

Considerable difficulty has been experienced in connection with the shovel work, due to the fact that quicksand was encountered at various points.

A Lidgerwood excavator with a 72-foot boom excavated to canal grade from about 800 feet west of the East Henrietta road bridge and closed for the winter about the middle of November, 1916. About the middle of May, 1917, this excavator began operations and moved to the guard-lock site, digging a drainage ditch. It

then began excavation for the guard-lock at the west end of the contract.

A derrick excavator worked at trimming the south slope east of Clinton avenue and South avenue. It excavated the south side of the prism to grade from about 2,000 feet east of Clinton avenue, to about 2,000 feet east of East Henrietta road, and also dug a drainage ditch between these points. It then moved to the north berme west of East Henrietta road and excavated for wash wall. This machine remained idle from December 20, 1916, to about May 1, 1917.

Excavation for wash wall was made with locomotive cranes on the north side from about 600 feet west of South avenue to about 1,200 feet east of East Henrietta road bridge; also on the south side from lock No. 33 to about 400 feet east of South avenue and at places between Clinton avenue and East Henrietta road bridge.

In the vicinity of lock No. 33 considerable trimming was done on the banks, both on the north and the south. The bottom of the prism just west of the lock, which was above grade for a short distance, was excavated. A small amount of trimming was also done just east of lock No. 33.

Approximately 20,000 cu. yds. of embankment were placed with teams and drag-scrapers in the vicinity of lock No. 33, on the north side, and approximately 16,000 cu. yds. were placed in the same manner on the south side at lock No. 33 and between Clinton avenue and East Henrietta road bridge.

Wash wall has been placed on the south side the greater portion of the distance between lock No. 33 and East Henrietta road bridge and on the north side from about 500 feet west of Clinton avenue bridge to about 1,400 feet east of East Henrietta road bridge. A small amount has also been placed west of East Henrietta road bridge, on the north side. A small amount of riprap was placed at the upper spillway of lock No. 33.

At lock No. 32 the lower gates have been erected and painted. The north leaf, however, has not been placed in position. The quoin and miter-posts have been placed on these gates and the fenders and walks practically completed on both upper and lower gates. At lock No. 33 the walks were placed on both gates. A considerable amount of steel piling for use in the banks west



**BARGE CANAL, CONTRACTS NOS. 21 AND 21-A**

Guard-lock just west of the Genesee river. The Barge canal crosses the Genesee through a pool formed by a dam. A guard-lock protects the canal on each side. Until a flood becomes so high as to make the crossing hazardous, navigation may be maintained through these locks.



of lock No. 33 has been delivered on the site of the work. None, however, has been driven.

Considerable work in setting up plant, building forms, etc., preliminary to the construction of the guard-lock, has been done.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Coffer-dams, pumping, bailing and draining.....	lump sum \$600	\$96	16.0
Grubbing.....	cu. yds. 7,700	2,968	38.5
Excavation.....	cu. yds. 640,700	268,768	42.0
Sheeting and bracing.....	ft. B. M. 94,000	0	0.0
Sodding slopes.....	sq. yds. 58,200	0	0.0
Forming embankment.....	cu. yds. 108,800	34,280	31.5
Lining.....	cu. yds. 1,110	10	0.9
Sawed lumber, yellow pine.....	ft. B. M. 8,600	1,020	11.9
White oak lumber in lock-gates, framing and erecting only.....	ft. B. M. 6,000	4,600	76.7
Foundation piles.....	lin. ft. 44,500	0	0.0
1-in. steel sheet-piling.....	sq. ft. 58,000	0	0.0
1-in. steel sheet-piling.....	sq. ft. 11,300	0	0.0
Second-class concrete.....	cu. yds. 14,100	0	0.0
Wash wall.....	cu. yds. 24,300	9,269	38.2
Second-class stone paving.....	sq. yds. 1,070	0	0.0
Third-class stone paving.....	sq. yds. 2,290	0	0.0
Cobblestone paving.....	sq. yds. 380	0	0.0
Third-class riprap.....	cu. yds. 320	0	0.0
Fourth-class riprap.....	cu. yds. 450	25	5.6
Structural steel.....	lbs. 13,730	0	0.0
Metal reinforcements.....	lbs. 41,740	0	0.0
Iron castings, plain.....	lbs. 20,480	0	0.0
Iron castings, machined.....	lbs. 9,950	0	0.0
Metal in lock-gates, lock-valves and buffer-beams, furnishing, erecting and painting.....	lbs. 960	960	100.0
Metal in lock-gates, lock-valves and buffer-beams, erecting and painting only.....	lbs. 228,000	195,478	85.7
Metal in guard-gates.....	lbs. 624,000	0	0.0
Wooden fence.....	lin. ft. 1,240	0	0.0
Storehouse.....	lump sum \$760	0	0.0
Bronze in bulkhead gates.....	lbs. 1,660	0	0.0
Gate-boats.....	No. 4	0	0.0
Sluice-gates, 36 in. x 36 in., complete in place.....	No. 4	0	0.0
Repairing fence.....	lump sum \$150	0	0.0
Second-quality 1-in. steel sheet-piling.....	sq. ft. 60,000	0	0.0
Gross estimate at contract prices.....	\$627,568 42	\$142,257 53	22.7

### Contract No. 21-A

This contract provides for completing the canal from about Sta. 2449, about 400 feet west of the Genesee river, to about Sta. 2566 + 58, about 442 feet from the east end of contract No. 6. Length, 2.23 miles. It was awarded to the Walsh Construction Co., of Davenport, Iowa, being signed on February 16, 1916. Construction work began March 1, 1916. The engineer's preliminary estimate was \$415,700.00, the contractor's bid, \$384,928.69.

Gordon Edson, Assistant Engineer, is in charge.

An extra work order under date of April 17, 1917, was issued for shifting the bearings of the Chili road highway bridge. This work was performed at a cost of \$110.44.

Pumping with from two to six centrifugal pumps has been continued 24 hours per day throughout the year. Four 10-inch and two 8-inch, motor-driven, centrifugal pumps have been used at Stas. 2450, 2504 and 2535, to keep prism unwatered, and two smaller, steam-driven, centrifugal pumps have been used at various times to pump water over temporary dams in the bottom of the prism for the purpose of unwatering short sections.

Steam-shovel excavation has progressed throughout the year. Three steam-shovels have been used, a model 100 Marion, a model 75 Marion, and a model 70C Bucyrus. They have worked between the Pennsylvania Terminal R. R. crossing, at Sta. 2484, and the west end of the contract, Sta. 2566 + 58. Four 50-ton standard-gage locomotives with 42 twelve-yard Western dump-cars have been used to carry the excavated material to two spoil-banks, one north of the canal between Brooks avenue crossing and the B. R. & P. R. R., and the other south of the canal between Chili road and the New York Central R. R.

The drilling was done by an Ingersoll-Rand wagon drill, using 2½-inch steel, and a number of air- and steam-driven tripod drills. The sides of the prism were line-drilled with holes from 18 inches to 30 inches apart by air-driven Jap drills. The drills were operated by compressed air furnished from a central compressor plant driven by a 200-hp. electric motor. The compressor plant was assembled on a flat car and shifted about as necessary.

A drag-line excavator, working along the top of the bank with a 1-yard bucket, has trimmed the earth slopes on the north side from Sta. 2494 to Sta. 2527.

Channeling the sides of the prism under the B. R. & P. R. R. bridge and under the Chili road highway bridge has been finished.

The wooden floor has been placed on top of the girders at the guard-lock. The second-class concrete counterweights for the guard-lock have been built.



BARGE CANAL, CONTRACT No. 59

Temporary Poirée dam in the Genesee river. The frames appear fitted together in the lowered position. To serve as a dam they are raised and needles are placed against them.



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A stream entrance has been constructed on the south side at Sta. 2543.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Clearing..... lump sum	\$100	0	\$45	0.0	45.0
Excavation..... cu. yds.	401,000	257,744	265,230	64.3	66.2
Sheeting and bracing..... ft. B. M.	12,000	0	0	0.0	0.0
Channeling..... sq. ft.	24,900	3,786	3,786	15.2	15.2
Forming embankment..... cu. yds.	880	0	0	0.0	0.0
Lining..... cu. yds.	520	0	0	0.0	0.0
Sawed lumber..... ft. B. M.	3,000	2,328	2,328	77.6	77.6
Second-class concrete..... cu. yds.	1,820	57.4	57.4	3.2	3.2
Dry retaining wall, including coping, cu. yds.	†100	0	0	0.0	0.0
Rubble masonry..... cu. yds.	525	0	0	0.0	0.0
Rock-spoil protection..... cu. yds.	4,800	0	0	0.0	0.0
Cobblestone paving..... sq. yds.	265	0	0	0.0	0.0
Fourth-class riprap..... cu. yds.	†105	0	0	0.0	0.0
Fourth-class grouted riprap..... cu. yds.	380	10	10	2.8	2.8
Structural steel..... lbs.	2,500	143	143	5.7	5.7
Metal reinforcement..... lbs.	3,260	0	0	0.0	0.0
Furnishing metal in guard-gates, f. o. b. cars, Rochester..... lbs.	†1,000	0	0	0.0	0.0
Transporting, erecting and painting metal in guard-gates..... lbs.	27,390	0	0	0.0	0.0
Iron castings, plain..... lbs.	180	0	0	0.0	0.0
Transporting, placing and painting snubbing-posts..... No.	30	0	0	0.0	0.0
Wooden fence..... lin. ft.	675	0	0	0.0	0.0
Drilling bolt-holes in rock..... lin. ft.	930	3	3	0.3	0.3
Chipping concrete..... cu. ft.	†10	0	0	0.0	0.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$15,000	\$8,700	\$9,000	58.0	60.0
Gross estimate at contract prices.....	\$384,928.69	\$225,393.47	\$231,970.57	59.6	60.2
Extra Work Order					
April 17, 1917..... cost plus 15 per cent			\$110.44		Finished

† Contingent item.

### Contract No. 162

This contract provides for constructing a drain across the canal at Main street, Brockport. It was awarded March 27, 1917, to Chas. A. Ingersoll of Medina, N. Y., being signed on March 27, 1917. Construction work began March 22, 1917. The engineer's preliminary estimate was \$6,173.90, the contractor's bid, \$7,273.90. The contract price as modified by alteration No. 1 is \$7,208.30.

A. S. Milinowski, Assistant Engineer, was in charge.

This contract has been modified by alteration No. 1, which provides for the use of second-class cast-iron pipe. This alteration decreased the contract price by \$65.60.

Work was completed June 15, 1917, and the preparation of the final estimate is now in progress.

The only plant used on construction work consisted of small tools and the steam-roller belonging to the village of Brockport, which was used for one day for resurfacing the highway.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Excavation.....	cu. yds. 1,490	1,282	85.6
Forming embankment.....	cu. yds. 1,340	1,014	75.7
Second-class concrete.....	cu. yds. 75	73.2	97.6
Brick masonry.....	cu. yds. 30	22.3	77.7
Wash wall, relaid.....	cu. yds. 7	7.9	112.9
Cobblestone paving.....	sq. yds. 10	8.4	84.0
Sheeting and bracing.....	ft. B. M. 36,000	24,054	66.8
12-in. vitrified pipe and specials, laid.....	lin. ft. 112	110	98.2
15-in. vitrified pipe and specials, laid.....	lin. ft. 280	264	94.3
Portland cement sidewalks, rebuilt.....	sq. yds. 65	60	92.3
Bituminous macadam pavement, rebuilt.....	sq. yds. 190	200	105.3
Brick pavement, relaid.....	sq. yds. 25	20.5	82.0
Waterproofing.....	sq. yds. 98	0	0.0
Cast-iron manhole covers.....	No. 2	2	100.0
Wrought iron.....	lbs. 360	0	0.0
Cutting steel sheet-piling.....	lump sum \$20	\$20	100.0
Chipping concrete.....	cu. ft. 12	6.5	54.2
Coffer-dam, pumping, bailing and draining.....	lump sum \$1,400	\$1,400	100.0
Second-class cast-iron pipe, laid.....	lbs. 16,400	17,084	104.1
Gross estimate at contract prices.....	\$7,258 30	\$6,247 52	86.1

\* Figures given include an excess quantity authorized by the Canal Board, as follows:  
 Portland cement sidewalks, rebuilt, 25 sq. yds., by resolution dated June 13, 1917.  
 This quantity at the contract price amounts to \$50.00.

### Terminal Contract No. 206

This contract was for constructing temporary terminal warehouses at Spencerport and Holley. It was awarded to J. B. McCabe & Son of Spencerport, N. Y., being signed on January 29, 1917. Construction work began March 28, 1917. The engineer's preliminary estimate for the warehouse at Spencerport was \$815.00, and the contractor's bid, \$723.00.

The contract was accepted by the Canal Board June 6, 1917, and the final estimate approved June 13, 1917. The amount paid for the Spencerport warehouse was \$698.75.

A. S. Milinowski, Assistant Engineer, was in charge.

Work was completed on this contract May 11, 1917.



BARGE CANAL, CONTRACT NO. 59

Temporary Poirée dam in the Genesee river—constructed to permit the opening of the canal in 1918, while the permanent dam should be under construction. The frames appear raised, ready for placing the needles.

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The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
<i>Warehouse at Spencerport</i>			
Excavation..... cu. yds.	60	8	13.3
Forming embankment..... cu. yds.	30	0	0.0
Second-class concrete..... cu. yds.	4	2.75	68.8
Iron and steel fastenings..... lbs.	110	114	103.6
Painting..... lump sum	\$40	\$40	100.0
Carpenter work..... lump sum	\$581	\$581	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Spencerport.....	\$723 00	\$698 75	96.6
<i>Warehouse at Holley</i>			
Excavation..... cu. yds.	60	8	13.3
Forming embankment..... cu. yds.	30	0	0.0
Second-class concrete..... cu. yds.	4	2.75	68.8
Iron and steel fastenings..... lbs.	110	114	103.6
Painting..... lump sum	\$40	\$40	100.0
Carpenter work..... lump sum	\$581	\$581	100.0
Electric work..... lump sum	\$40	\$40	100.0
Total for Holley.....	\$723 00	\$698 75	96.6
<i>Summary of Contract</i>			
Warehouse at Spencerport.....	\$723 00	\$698 75	96.6
Warehouse at Holley.....	723 00	698 75	96.6
Gross estimate at contract prices.....	\$1,446 00	\$1,397 50	96.6

Senior Assistant Engineer A. R. Morse reports:

The part of residency No. 9 under my supervision is divided into the following contracts: Nos. 59, 59-A, 138 and 144, terminal contract No. 48, and the bridge over the harbor at Clarissa street, also Genesee street sewer overflows Nos. 1 and 2.

Of these contracts, Nos. 59, 138 and 144, and terminal contract No. 48 have been let during the year. Plans and agreements for Clarissa street bridge, also preliminary sketches for location of Genesee street sewer overflows Nos. 1 and 2 are now under preparation.

On this part of residency No. 9 there are four railroad crossings in process of construction, all within the limits of contract No. 59, viz.: the Erie railroad crossing over the Genesee river which is about 80 per cent completed, the main girders being in place over the channel; the Erie and the Lehigh Valley railroad crossings east of Genesee Valley park, of which the Lehigh Valley

crossing is practically completed, although traffic has not been turned over it as yet, while no work has been done on the Erie crossing; the Pennsylvania railroad main line crossing west of the Genesee river, on which detours have been graded and actual construction work started on the main abutments.

*Contract No. 59*

This contract provides for the construction of the canal from the west end of contract No. 23-A, east of the Genesee river, to the east end of contract No. 21-A, west of the Genesee river, and for the construction of Rochester harbor, between the Barge canal crossing at Genesee Valley park and a point about 400 feet south of the proposed dam in the vicinity of Court street bridge. Length along canal, 0.63 mile. Length along harbor, 3.25 miles. It was let November 3, 1916, to MacArthur Brothers Company, of New York city, being signed on November 3, 1916. Construction work began on January 3, 1917. The engineer's preliminary estimate was \$1,675,252.86, the contractor's bid, \$1,596,788.91. The contract price as modified by alteration No. 1 is \$1,601,279.11.

Arthur S. Whitbeck, Assistant Engineer, is in charge of construction.

The contract has been modified by alteration No. 1, which provides for moving the west river wall and making other changes on account of an agreement with the Erie railroad, for placing mooring cleats on the wall, and for the use of second-quality steel sheet-piling. It increased the contract price by \$4,490.20.

An extra work order dated January 22, 1917, provided for furnishing materials and constructing an engineers' field office on the site of the contract. The price agreed upon was \$500.00. The work required by this work order has been completed and payment, amounting to \$500.00 on a lump sum basis, has been made.

Work has been in progress in excavating the prism through Genesee Valley park, the contractors using two traction graders with mule team disposal equipment. In excavating for the west river wall a Bucyrus caterpillar drag-line excavator was used and a movable concrete plant was employed in constructing the wall. For the river excavation a large Bucyrus drag-line excavator is



BARGE CANAL, CONTRACT No. 59

Beginning the work of excavating the canal channel through Genesee Valley park, Rochester.





ready for work. The Elmwood avenue bridge has been partially raised. The steel sheet-piling cut-off along the old State dike has been completed. In Genesee Valley park the clearing and the drainage system have been practically completed.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Clearing.....	lump sum \$1,000	\$900	90.0
Excavation.....	cu. yds. 773,110	12,644	1.6
Sheeting and bracing.....	ft. B. M. 501,000	30,568	6.1
Round-timber bracing.....	lin. ft. 19,000	1,202	6.3
Forming embankment, first-class.....	cu. yds. 20,560	137	0.7
Forming embankment, second-class.....	cu. yds. 349,800	5,084	1.5
Loam surfacing.....	cu. yds. 67,390	7,154	10.6
Lining.....	cu. yds. 215	0	0.0
Sawed lumber, yellow pine.....	ft. B. M. 1,000	0	0.0
Foundation piles.....	lin. ft. 32,460	0	0.0
1-in. steel sheet-piling.....	sq. ft. 1,110	0	0.0
1-in. steel sheet-piling.....	sq. ft. 31,540	7,861	24.9
Second-class concrete.....	cu. yds. 70,500	1,018	1.4
First-class reinforced concrete.....	cu. yds. 2,860	0	0.0
Second-class reinforced concrete.....	cu. yds. 764	0	0.0
First-class masonry.....	cu. yds. 208	66	31.7
First-class masonry, relaid.....	cu. yds. 130	9	6.9
Repointing old masonry.....	lin. ft. 8,680	0	0.0
Wash wall.....	cu. yds. 12,460	0	0.0
Third-class stone paving, grouted.....	sq. yds. 70	0	0.0
Cobblestone paving, grouted.....	sq. yds. 260	0	0.0
Second-class riprap.....	cu. yds. 385	0	0.0
Rock-spoil protection.....	cu. yds. 17,000	0	0.0
4-in. porous tile, laid.....	lin. ft. 17,930	16,195	90.0
6-in. vitrified pipe, laid.....	lin. ft. 11,400	1,107	9.7
8-in. vitrified pipe, laid.....	lin. ft. 2,968	1,590	53.6
12-in. vitrified pipe, laid.....	lin. ft. 1,260	84	6.7
18-in. vitrified pipe, laid.....	lin. ft. 2,860	0	0.0
Structural steel.....	lbs. 703,710	0	0.0
Metal reinforcement.....	lbs. 305,970	0	0.0
Metal duct.....	lbs. 1,183	0	0.0
Iron castings, plain.....	lbs. 32,780	0	0.0
Portland cement sidewalks.....	sq. ft. 7,480	0	0.0
Gravel walks.....	sq. yds. 12,858	0	0.0
Relaying sidewalks.....	sq. yds. 210	0	0.0
Asphalt pavement.....	sq. yds. 2,698	0	0.0
Macadam pavement.....	sq. yds. 17,530	0	0.0
Macadam resurfacing.....	sq. yds. 5,950	0	0.0
Temporary wooden fence.....	lin. ft. 14,000	5,709	40.7
Chain fence.....	lin. ft. 1,940	0	0.0
Concrete balustrade on main drive bridge.....	lin. ft. 412	0	0.0
Concrete balustrade on foot bridge.....	lin. ft. 1,390	0	0.0
Waterproofing, one-ply.....	sq. yds. 1,430	0	0.0
Waterproofing, two-ply.....	sq. yds. 950	0	0.0
Seeding.....	acres 60	0	0.0
Operating machinery, Lower Red creek.....	lump sum \$1,500	0	0.0
Maintaining park traffic.....	lump sum \$800	0	0.0
Maintaining highway traffic, Elmwood avenue bridge.....	lump sum \$100	\$240	60.0
Raising superstructure, Elmwood avenue bridge.....	lump sum \$600	0	0.0
Catch-basins, complete.....	No. 20	0	0.0
Coffer-dams, pumping, bailing and draining.....	lump sum \$50,000	\$750	1.5
Additional coffer-dams and incidentals.....	lump sum \$10,000	0	0.0
1-in. steel sheet-piling, second-quality.....	sq. ft. 5,600	1,352	24.2
Deduct for sheeting and bracing, reused.....	ft. B. M. ....	5,519	.....
Deduct for round-timber bracing, reused.....	lin. ft. ....	243	.....
Gross estimate at contract prices.....	\$1,601,279 11	\$41,524 67	2.6
<i>Extra Work Order</i>			
Jan. 22, 1917.....	lump sum \$500	\$500	Finished

*Contract No. 144*

This contract provides for constructing two concrete bridges over Red creek in Genesee Valley park, Rochester. It was let to W. F. Martens & Co., Inc., of Rochester, N. Y., being signed on June 14, 1917. Construction work began on June 18, 1917. The engineer's preliminary estimate was \$41,480.70, the contractor's bid, \$41,258.40.

L. G. Fisher, Assistant Engineer, is in charge of construction.

A small portable office building has been erected near the site of the upper bridge.

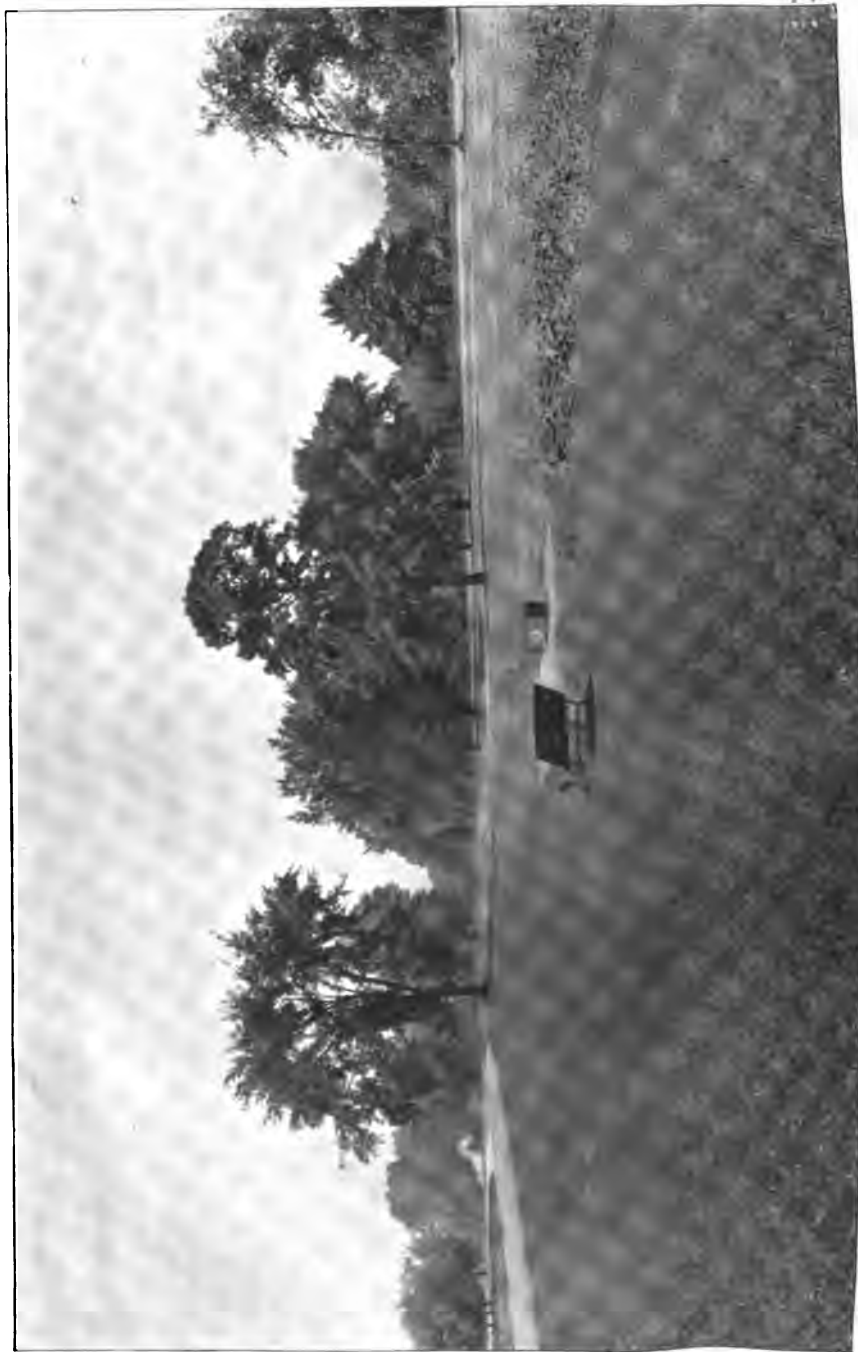
About 200 cu. yds. of excavation at the site of the lower bridge and about 30 cu. yds. of embankment at the site of the upper bridge have been completed to date, the plant in use consisting of a plow and seven scrapers.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing..... lump sum	\$100	0	0.0
Excavation..... cu. yds.	11,400	200	1.8
Forming embankment..... cu. yds.	9,800	30	0.3
Loam surfacing..... cu. yds.	900	0	0.0
First-class reinforced concrete..... cu. yds.	800	0	0.0
Second-class reinforced concrete..... cu. yds.	900	0	0.0
Metal reinforcement..... lbs.	127,000	0	0.0
Metal duct..... lbs.	310	0	0.0
Gravel walks..... sq. yds.	340	0	0.0
Asphalt pavement..... sq. yds.	540	0	0.0
Macadam pavement..... sq. yds.	620	0	0.0
Concrete railing..... lin. ft.	400	0	0.0
Chain fence..... lin. ft.	330	0	0.0
Galvanised steel corner bar..... lin. ft.	400	0	0.0
Seeding..... acres	1.5	0	0.0
Repairing macadam pavement..... lump sum	\$300	0	0.0
Coffer-dam, pumping, bailing and draining..... lump sum	\$2,500	0	0.0
Gross estimate at contract prices.....	\$41,258 70	\$134 50	0.3

*Contract No. 59-A*

This contract provides for the construction of a sewer from Genesee Valley park to a point about 100 feet south of Court street bridge, Rochester. Length, 2.914 miles. It was let to P. H. Murray of Rochester, N. Y., being signed on July 3, 1916. Construction work began on July 20, 1916. The engineer's pre-



**BARGE CANAL, CONTRACT No. 59**  
**Filling with spoil from Barge canal excavation the low lands in Genesee Valley park, Rochester, which are subject to flooding by the river.**

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liminary estimate was \$124,260.55, the contractor's bid, \$110,689.45.

J. S. Summers and W. W. Brown, Assistant Engineers, have been in charge of construction.

Work on this contract has been in progress throughout the year. The plant in use consists of a Moore trench excavator, two traveling derricks and an Erie steam-shovel.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date	
Coffer-dams, pumping, bailing and draining.....	lump sum	\$6,000	\$4,920	82.0
Trenching and backfilling for 24-in. cast-iron pipe.....	lin. ft.	3,578	3,511	98.2
Trenching and backfilling for 24-in. reinforced concrete pipe.....	lin. ft.	3,124	3,075	98.4
Trenching and backfilling for 30-in. reinforced concrete pipe.....	lin. ft.	1,325	863	65.0
Trenching and backfilling for 36-in. reinforced concrete pipe.....	lin. ft.	2,490	2,214	88.8
Trenching and backfilling for 48-in. reinforced concrete pipe.....	lin. ft.	215	0	0.0
Trenching and backfilling for 54-in. reinforced concrete pipe.....	lin. ft.	4,705	1,630	34.7
24-in. cast-iron pipe laid.....	lin. ft.	3,578	3,547	99.1
24-in. reinforced concrete pipe, laid.....	lin. ft.	3,124	3,129	100.2
30-in. reinforced concrete pipe, laid.....	lin. ft.	1,325	867	65.5
36-in. reinforced concrete pipe, laid.....	lin. ft.	2,490	2,071	84.0
48-in. reinforced concrete pipe, laid.....	lin. ft.	215	0	0.0
54-in. reinforced concrete pipe, laid.....	lin. ft.	4,705	1,565	33.2
Sewer intake, complete.....	lump sum	\$560	\$560	100.0
Lateral No. 1 and catch-basin.....	lump sum	\$160	\$152	95.0
Lateral No. 2.....	lump sum	\$365	\$365	100.0
Lateral No. 2-A.....	lump sum	\$25	\$25	100.0
Lateral No. 3.....	lump sum	\$85	\$80 75	95.0
Lateral No. 4.....	lump sum	\$260	0	0.0
Lateral No. 5.....	lump sum	\$210	0	0.0
Lateral No. 6.....	lump sum	\$515	0	0.0
Connection No. 1.....	lump sum	\$45	\$45	100.0
Connection No. 2.....	lump sum	\$845	\$845	100.0
Manholes, complete.....	No.	23	14	60.9
Gross estimate at contract prices.....		\$110,689 45	\$71,141 19	64.3

### Contract No. 138

This contract provides for constructing a movable dam, bulkheads, retaining walls and incidental work, at Rochester. It was let to the Combined Construction Company, of Rochester, N. Y., the contract being signed on April 19, 1917. Construction work began on June 8, 1917. The engineer's preliminary estimate was \$302,700.30, the contractor's bid, \$321,115.12.

J. S. Summers, Assistant Engineer, is in charge of construction.

The work done to date has consisted in tearing down the old

gate-house and putting in the concrete foundations for the boiler-house.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	11,100	0	0.0
Sheeting and bracing.....ft. B. M.	46,000	0	0.0
Round-timber bracing.....lin. ft.	2,400	0	0.0
Channeling.....sq. ft.	700	0	0.0
Drilling holes in rock.....lin. ft.	820	0	0.0
Forming embankment.....cu. yds.	1,800	0	0.0
Sawed lumber, yellow pine.....ft. B. M.	16,000	0	0.0
Sawed lumber, white oak.....ft. B. M.	5,000	0	0.0
First-class concrete.....cu. yds.	103	0	0.0
Second-class concrete.....cu. yds.	7,370	0	0.0
First-class reinforced concrete.....cu. yds.	1,070	0	0.0
Second-class reinforced concrete.....cu. yds.	920	0	0.0
18-in. vitrified pipe, laid.....lin. ft.	520	0	0.0
8-in. vitrified pipe, laid.....lin. ft.	500	0	0.0
6-in. vitrified pipe, laid.....lin. ft.	230	0	0.0
Structural steel.....lbs.	1,510,000	0	0.0
Metal reinforcement.....lbs.	90,500	0	0.0
Wrought-iron chains for Mohawk dam.....lbs.	30,000	0	0.0
Pipe railing.....lbs.	13,800	0	0.0
Embedded cast-iron shoes for Mohawk dam.....lbs.	14,100	0	0.0
Bronze in head-gates.....lbs.	1,270	0	0.0
Machinery.....lbs.	113,000	0	0.0
Gate-valves, sluice-gates, plug-valves, etc., for sector gates.....lump sum	\$2,800	0	0.0
Gate-hoists.....No.	11	0	0.0
Indicator for sector gates.....lump sum	\$600	0	0.0
Weir tube equipment.....lump sum	\$2,400	0	0.0
Operator's house.....lump sum	\$2,640	0	0.0
Metal in winches.....lbs.	45,000	0	0.0
Electrical equipments for winches.....No.	2	0	0.0
Electrical equipment for operator's house.....lump sum	\$624	0	0.0
Trolley brackets.....No.	8	0	0.0
Trolley poles.....No.	2	0	0.0
Lamp poles.....No.	3	0	0.0
Outdoor lamp brackets.....No.	3	0	0.0
Outdoor 750-watt lamps.....No.	6	0	0.0
400,000 C. M. lead-covered conductors.....lin. ft.	570	0	0.0
No. 2 lead-covered conductors.....lin. ft.	300	0	0.0
No. 8 lead-covered conductors.....lin. ft.	850	0	0.0
No. 8 rubber-insulated braided conductors.....lin. ft.	900	0	0.0
No. 10 rubber-insulated braided conductors.....lin. ft.	116	0	0.0
No. 0 bare copper conductors.....lin. ft.	570	0	0.0
Metal duct.....lbs.	5,460	0	0.0
Maintenance accessories.....lump sum	\$210	0	0.0
Removing and rebuilding heating plant.....lump sum	\$7,016	\$705 60	35.0
Coffer-dams, pumping, bailing and draining.....lump sum	\$12,000	0	0.0
Gross estimate at contract prices.....	\$321,115 12	\$705 60	0.2



BARGE CANAL, CONTRACT NO. 59

Lowering into place a 110-foot girder of the Lehigh Valley R. R. bridge near Rochester — one of the last railroad bridges to be built across the Barge canal.



5

*Construction Work — Barge Canal*

The Barge canal work done on section 9 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE								
	Contract No. 6	Contract No. 7 (section 9)	Contract No. 21	Contract No. 21-A	Contract No. 23	Contract No. 23-A	Contract No. 23-B	Contract No. 38	Contract No. 41
1905	\$59,190								
1906	197,840								
1907	166,380	\$6,020							
1908	236,860								
1909	190,790	20,429						\$15,390	\$80,410
1910	181,200		\$141,730		\$315,740			897	143,359
1911	48,390		352,850		444,640				7,884
1912	8,154		276,470		368,900				
1913			185,100		167,130				
1914			12,850		16,700				
1915					7,016		\$4,736		
1916				\$6,670					
1917				225,400		\$142,250			
Totals	\$1,033,864	\$26,449	\$949,000	\$231,970	\$1,205,125	\$142,250	\$4,736	\$16,287	\$241,644

*Extra Work Orders Paid, 1906-1917, Inclusive*

1909	\$23	\$24						\$348	
1910									\$37
1911	743								
1912					\$601				
1913					2,000				
1914									
1915									
1917				\$110					
Totals	\$766	\$24		\$110	\$2,601			\$348	\$37

## VALUE OF WORK DONE

YEAR*	Culvert No. 30	Contract No. 59	Contract No. 59-A	Contract No. 60	Contract No. 61	Contract No. 63	Contract No. 63-A	Contract No. 75 (section 9)	Contract No. 82
1905									
1906									
1907									
1908				\$6,580					
1909				516,330	\$81,280				
1910				416,940	187,950	\$14,510			
1911				244,310	308,010	576,710			\$8,330
1912				102,920	284,630	829,970		\$27,380	12,990
1913				21,660	152,840	857,970		13	
1914				9,179	33,573	293,193			6,906
1915									
1916	\$368,018						\$38,800		
1917	4,581	\$41,520	\$71,140				228,720		
Totals	\$372,549	\$41,520	\$71,140	\$1,317,919	\$1,048,283	\$2,572,353	\$262,520	\$27,393	\$28,286

*Extra Work Orders Paid, 1906-1917, Inclusive*

1909				\$4,958					
1910				5,955	\$103				
1911				15,145		\$147,242			
1912				783		74,894			
1913				1,501		143,899		\$1,922	
1914					281	54,241			\$422
1915						580			
1917		\$500					\$6,823		
Totals		\$500		\$28,342	\$383	\$420,856	\$6,823	\$1,922	\$422

YEAR*	VALUE OF WORK DONE								Totals
	Contract No. 94 (section 9)	Contract No. 105 (section 9)	Contract No. 106 (section 9)	Contract No. 112 (section 9)	Contract No. 113 (section 9)	Contract No. 138	Contract No. 144	Contract No. 163	
1905.....									\$59,190
1906.....									197,840
1907.....									172,400
1908.....									243,530
1909.....									914,639
1910.....									1,252,317
1911.....									1,966,004
1912.....		\$28,530							1,034,944
1913.....		131,096		\$89,238	\$9,850				1,604,897
1914.....	\$75,290		\$8,430		1,159				457,330
1915.....	28,765		68,430						108,946
1916.....			855						409,243
1917.....						\$700	\$130	\$6,240	730,631
Totals...	\$104,065	\$159,626	\$77,705	\$89,238	\$11,009	\$700	\$130	\$6,240	\$10,041,991

Extra Work Orders Paid, 1905-1917, Inclusive									
1909.....									\$5,353
1910.....									6,154
1911.....									163,120
1912.....									76,273
1913.....									149,322
1914.....									54,945
1915.....	\$742		\$2,864						4,086
1917.....									7,433
Totals...	\$642		\$2,864						\$466,700

\* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1905, 1906, 1907, 1908 and 1916.

The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 7, sections 1, 5 and 7, Erie canal, and section 2, Champlain; contract No. 75, section 10, Erie; contract No. 94, sections 8 and 10, Erie; contract No. 105, section 10, Erie; contract No. 106, sections 8 and 10, Erie; contract Nos. 112 and 113, section 10, Erie.

### Terminal Contract No. 48 — Rochester

This contract provides for constructing a terminal on the east side of the Genesee river at Rochester. It was let to Michael H. Ripton, of Rochester, N. Y., the contract being signed on October 19, 1916. Construction work began on November 22, 1916. The engineer's preliminary estimate was \$101,000.00, the contractor's bid, \$93,828.00.

C. E. Elmendorf, Assistant Engineer, is in charge of construction.

The contract has been modified by alteration No. 1, which provides for changing the type of cut-off under the dockwall. This alteration does not change the amount of the contract price.

The plant employed on this contract consists of one traveling derrick, used for excavation, one Vulcan locomotive and seven



**BARGE CANAL, TERMINAL CONTRACT NO. 48—ROCHESTER**  
Building the terminal dockwall on the east side of the Genesee river.

200

dump-cars, used for hauling material to spoil-banks, and two concrete mixers with Koppel cars for placing concrete. Blaw steel forms were used.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Total work done to date	Per cent of work done to date
Clearing.....	hump sum \$200	\$100	50.0
Removal of buildings.....	hump sum \$1,500	\$345	23.0
Removing railroad tracks.....	lin. ft. 2,000	787	39.3
Coffer-dams, pumping, bailing and draining.....	hump sum \$5,000	\$1,500	30.0
Excavation.....	cu. yds. 42,640	8,367	19.6
Sheeting and bracing.....	ft. B. M. 7,000	0	0.0
Forming embankment.....	cu. yds. 25,700	0	0.0
Sawed lumber.....	ft. B. M. 2,700	0	0.0
Sawed lumber, treated.....	ft. B. M. 15,500	0	0.0
Second-class concrete.....	cu. yds. 8,800	2,822	28.7
8-in. vitrified tile, laid.....	lin. ft. 1,530	76	5.0
Structural steel.....	lbs. 700	0	0.0
Malleable cast-iron nosing.....	lin. ft. 1,400	306	21.9
Metal reinforcement.....	lbs. 17,800	7,985	44.9
Fender fastenings.....	No. 287	17	5.9
Steel sheet-piling.....	sq. ft. 670	661	98.7
Pipe railing.....	lin. ft. 1,450	0	0.0
Cut-off wall.....	sq. ft. 2,450	1,267	51.7
Gross estimate at contract prices.....	\$93,828 00	\$25,487 65	27.2

### Construction Work — Barge Canal Terminals

The Barge canal terminal work done on section 9 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE			
	Contract No. 48	Contract No. 49	Contract No. 206 (section 9)	Totals
1916.....		\$1,204		\$1,204
1917.....	\$25,480		\$699	26,179
Totals.....	\$25,480	\$1,204	\$699	\$27,383
<i>Extra Work Order</i>				
1916.....		\$150		\$150
Totals.....		\$150		\$150

\* The year 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.  
 NOTE.—No extra work orders were paid on the contracts on this section during 1917.  
 Under terminal contract No. 206 work has also been done on section 10, Erie canal.

## ERIE CANAL, RESIDENCY No. 10-A

Senior Assistant Engineer B. E. Failing reports:

Residency No. 10-A extends from the east line of Orleans county to 100 feet east of Main street bridge in Gasport, a distance of 32.05 miles, and includes within its limits Barge canal contracts Nos. 9, 62, 64 and 65, and portions of contracts Nos. 75, 105, 106, 113 and 163, also terminal contracts Nos. 39, 50, 51 and 54, and a portion of terminal contract No. 211. All of these contracts were finished in previous years, with the exception of Barge canal contract No. 163 and terminal contracts Nos. 39, 51, 54 and 211.

State property lines were mapped on parts of contracts Nos. 9, 64 and 65.

*Contract No. 163*

This contract provides for removing and replacing puddle immediately east of Millard's bridge, raising Spier's road bridge, completing the crests of spillways, constructing a road culvert and making repairs to a guard-gate sill, all between Rochester and Lockport.

Considerable field and office work has been done on this contract during the year.

*Terminal Contract No. 206*

This contract was for constructing temporary terminal warehouses at Spencerport and Holley. It was awarded to J. B. McCabe & Son of Spencerport, N. Y., being signed on January 29, 1917. Construction began March 28, 1917. The engineer's preliminary estimate for the warehouse at Holley was \$815.00, and the contractor's bid, \$723.00.

The contract was accepted by the Canal Board June 6, 1917, and the final estimate approved June 13, 1917. The amount paid for the Holley warehouse was \$698.75.

A. S. Milinowski, Assistant Engineer, was in charge.

Work was completed on this contract May 11, 1917.

For details of items estimated see the report for this contract in Residency No. 9.



**BARGE CANAL CHANNEL AND HARBOR AT MEDINA**

In circling a gorge at Medina the canal runs between high walls and has a wide section for bettering sharp curvature. This wide water afforded a convenient harbor, which has been suitably improved to form a terminal. The terminal is seen in the middle distance.





*Terminal Contract No. 39 — Albion*

This contract is for constructing a terminal at Albion. It was awarded to Fred H. Rhodey, of Albion, N. Y., being signed on March 29, 1917. The engineer's preliminary estimate was \$2,700.00, the contractor's bid, \$2,952.50.

H. N. Metzger, Assistant Engineer, is in charge.

This terminal is located on the south side of the Barge canal, about 200 feet west of Main street and extending along the canal for a distance of about 330 feet. The contract provides for placing fenders and snubbing-posts on the existing dockwall, clearing and grading the terminal site and placing gravel surfacing over part of the area.

Work on this terminal was begun in April and is now nearing completion.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Clearing.....	lump sum \$35	\$35	100.0
Removing buildings.....	lump sum \$65	\$65	100.0
Excavation.....	cu. yds. 2,308	2,100	91.0
Embankment.....	cu. yds. 2,100	1,700	81.0
Sawed lumber, treated.....	ft. B. M. 5,000	0	0.0
Wooden fence.....	lin. ft. 210	0	0.0
Iron castings, plain.....	lbs. 1,900	1,650	86.8
Fender fastenings.....	No. 60	68	113.3
Gravel surfacing.....	cu. yds. 425	280	65.9
Increasing height of manhole.....	lump sum \$15	\$15	100.0
Drilling and grouting.....	lin. ft. 140	110	78.6
Gross estimate at contract prices.....	\$2,952 50	\$2,103 00	71.2

*Terminal Contract No. 211*

This contract provides for constructing terminal warehouses at Newark, Albion and Medina. The Albion and Medina warehouses are within this residency. The contract was awarded to W. F. Martens & Co., Inc., being signed on June 14, 1917. The engineer's preliminary estimate for the Albion and Medina warehouses was \$2,800.00 and \$3,000.00, respectively, and the contractor's bid, \$2,472.00 and \$2,765.00, respectively.

The work at Albion and Medina is in charge of H. N. Metzger, Assistant Engineer.

At Albion the work was commenced in June and the foundation for the warehouse completed during the month.

At Medina the work was commenced in June and was nearly completed during the month.

*Terminal Contract No. 51 — Medina*

This contract provided for constructing a terminal at Medina. It was awarded to Fred H. Rhodey, of Albion, N. Y., being signed on February 16, 1916. The engineer's preliminary estimate was \$6,379.00, the contractor's bid, \$5,325.00

The contract was accepted by the Canal Board January 4, 1917, and the final estimate, amounting to \$4,362.65, was approved January 11, 1917.

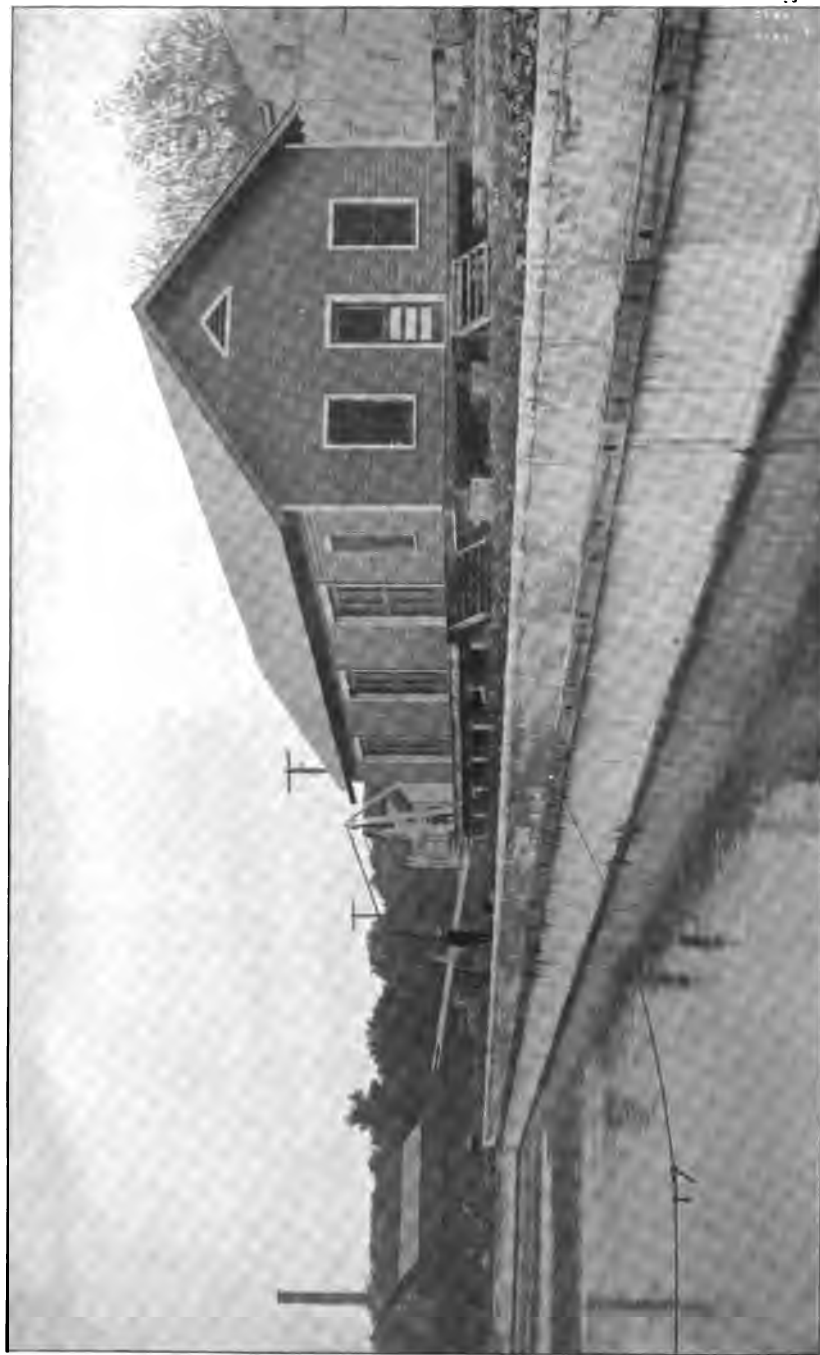
Elwin G. Speyer, Assistant Engineer, was in charge.

This terminal is located on the south side of the Barge canal at the foot of Church street in the village of Medina. The work consisted in clearing buildings off from the site, increasing the height of the dockwall, grading, constructing two approaches and placing gravel surfacing.

The contract was finished in November, 1916. The work during the year consisted mainly in raising the concrete dockwall, grading and surfacing.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation..... cu. yds.	5,400	349	3,600	6.5	66.8
Sawed lumber..... ft. B. M.	5,400	5,190	5,190	96.1	96.1
Wooden fence..... lin. ft.	285	304	304	114.7	114.7
Second-class concrete..... cu. yds.	200	186	186	93.0	93.0
6-in. vitrified pipe drain..... lin. ft.	35	0	34	0.0	97.1
Structural steel..... lbs.	3,000	0	2,804	0.0	93.5
Iron castings, plain..... lbs.	4,100	3,864	3,864	94.2	94.2
Malleable cast-iron nosing..... lin. ft.	530	511	511	96.4	96.4
Fender fastenings..... No.	85	86	86	101.2	101.2
Broken stone or gravel surfacing..... cu. yds.	400	401	401	100.2	100.2
Reconstructing two manholes..... lump sum	\$50	0	\$50	0.0	100.0
Drilling holes in concrete..... lin. ft.	450	0.25	408	0.1	90.9
Deduct for buildings removed..... lump sum	\$500	0	\$500	0.0	100.0
Gross estimate at contract prices.....	\$5,325 00	\$2,872 32	\$4,362 65	83.9	81.9
<i>Extra Work Order</i>					
June 9, 1916..... lump sum	\$500 18	.....	\$500 18	.....	Finished



BARGE CANAL, TERMINAL CONTRACTS NOS. 51 AND 211—MEDINA

General view of the terminal. Under canal construction a suitable harbor was provided. Under terminal contracts the wall was raised, the site graded, a warehouse built and other incidental work performed.



*Terminal Contract No. 54 — Middleport*

This contract provides for constructing a terminal at Middleport. It was awarded to Hammond-Tracy Construction Co., Inc., of Middleport, N. Y., being signed on March 27, 1917. Work was begun in April, 1917. The engineer's preliminary estimate was \$1,250.00, the contractor's bid, \$1,234.00.

H. N. Metzger, Assistant Engineer, is in charge.

The terminal is located on the north side of the canal between Main and Vernon streets in the village of Middleport. The work consisted in grading and surfacing the terminal site and approaches and setting snubbing-posts.

Work was commenced in April and the grading was finished in June, but on account of the wet spring and bad roads the lining has not been placed. Nearly all the material used in grading was hauled by teams from a borrow-pit on State lands near the site.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	800	435	54.4
Forming embankment.....cu. yds.	700	400	57.1
Second-class concrete.....cu. yds.	8	6.7	83.7
Iron castings, plain.....lbs.	1,800	1,680	93.3
Dowels.....lbs.	64	61	95.3
Surfacing.....cu. yds.	200	35	17.5
Gross estimate at contract prices.....	\$1,234 00	\$643 75	52.2

### ERIE CANAL, RESIDENCY No. 10-B

Senior Assistant Engineer B. E. Failing reports:

This residency extends from a point about 100 feet east of the Gasport bridge westward to the Sulphur Springs guard-lock, a distance of 11.7 miles, and includes within its limits contracts Nos. 66, 67 and 40 and parts of contracts Nos. 105, 106, 112 and 94 and terminal contract No. 17, which were finished in previous years, and contracts Nos. 98 and 152 and terminal contract No.

210 and a portion of terminal contract No. 101, which were active during the year.

*Contract No. 98*

This contract provides for constructing a lift-bridge at Adams street, Lockport, and removing the existing lift-bridge at Chapel street, Lockport. It was awarded to Tifft Construction Co., Inc., of Buffalo, N. Y., being signed on November 24, 1916. Work was begun in February, 1917. The engineer's preliminary estimate was \$77,496.00, the contractor's bid, \$82,276.25.

H. N. Metzger, Assistant Engineer, is in charge.

Work was commenced last February and both pits, abutments and wing-walls were finished before the opening of navigation, with the exception of a small wing-wall on the west side of the south abutment. Excavation at Adams street bridge was finished. Also concrete forms were built for the operator's cabin. Excavation was handled by a clam-shell bucket, the material being dumped into wagons and carted to spoil-bank. The contractor's plant consisted mainly of two stiff-leg derricks, operating clam-shell buckets, a concrete mixer and dump-wagons.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation..... cu. yds.	12,800	5,284	41.3
Forming embankment..... cu. yds.	4,150	0	0.0
Sawed lumber..... ft. B. M.	23,400	0	0.0
Second-class concrete..... cu. yds.	874	665	69.2
First-class reinforced concrete..... cu. yds.	1,100	905	82.3
Wash wall..... cu. yds.	383	0	0.0
Wash wall, relaid..... cu. yds.	290	7	2.4
Structural steel..... lbs.	375,700	9,044	2.4
Metal reinforcement..... lbs.	66,900	52,160	78.0
Machinery..... lbs.	65,400	0	0.0
Concrete sidewalks..... sq. ft.	1,760	0	0.0
Concrete curbing..... lin. ft.	384	0	0.0
Brick pavement..... sq. yds.	65	0	0.0
Water-bound macadam, 6 inches thick..... sq. yds.	165	0	0.0
Water-bound macadam, 9 inches thick..... sq. yds.	775	0	0.0
Wooden fence..... lin. ft.	354	0	0.0
Wrought-iron pipe railing..... lin. ft.	68	0	0.0
Lattice railing..... lin. ft.	370	0	0.0
Metal duct..... lbs.	2,200	637	29.0
Drilling holes in existing masonry..... lin. ft.	36	0	0.0
Electrical equipment..... lump sum	\$4,200	0	0.0
Plumbing..... lump sum	\$680	\$204	30.0
Operator's house..... lump sum	\$2,100	\$420	20.0
Maintaining navigation..... lump sum	\$600	\$300	50.0
Coffer-dams, pumping, bailing and draining..... lump sum	\$600	\$546	91.0
Deduct for bridge superstructure..... lump sum	\$503	0	0.0
Gross estimate at contract prices.....	\$82,276 25	\$20,254 66	24.6

*Contract No. 152*

This contract covers repairs to be made to lock No. 35 at Lockport. Surveys were made and measurements were taken of the damaged section of the lock and plans were made, showing the present conditions. Also plans were made of the coffer-dam which is proposed to be used during the reconstruction of part of the lock.

*Construction Work — Barge Canal*

The Barge canal work done on section 10 of the Erie canal is summarized by years and contracts in the following table:

YEAR*	VALUE OF WORK DONE							
	Contract No. 9	Contract No. 40	Contract No. 62	Contract No. 64	Contract No. 65	Contract No. 66	Contract No. 67	Contract No. 75 (section 10)
1908.....	\$62,590							
1909.....	244,390	\$125,840		\$221,950		\$173,840		
1910.....	271,080	623,990		227,210		200,410		
1911.....	47,080	508,270	\$657,330	245,920		244,620	\$289,040	
1912.....	8,341	475,410	1,042,310	132,860		145,370	450,400	\$13,000
1913.....		373,878	1,019,860	226,000	\$220,810	9,660	281,760	35
1914.....			182,424	144,649	776,670	3,871	25,937	
1915.....					103,167			
1916.....								
1917.....								
Totals.....	\$655,461	\$2,112,408	\$2,831,924	\$1,198,389	\$1,109,647	\$777,761	\$1,027,137	\$13,635

<i>Extra Work Orders Paid, 1908-1917, Inclusive</i>								
1909.....						\$1,373		
1910.....	\$3,490	\$95		\$108				
1911.....	104		\$1,715			3,013	\$7,543	
1912.....			2,312				2,288	
1913.....			9,751			1,013	5,623	\$592
1914.....		728	4,406	1,483			6,181	
1915.....			4,240		\$1,271			
1916.....								
Totals.....	\$3,594	\$823	\$22,424	\$1,591	\$1,271	\$5,399	\$21,635	\$592



YEAR*	VALUE OF WORK DONE						Totals
	Contract No. 94 (section 10)	Contract No. 98	Contract No. 105 (section 10)	Contract No. 106 (section 10)	Contract No. 112 (section 10)	Contract No. 113 (section 10)	
1908.....							\$62,590
1909.....							798,040
1910.....							1,322,680
1911.....							1,917,240
1912.....			\$2,060				2,270,181
1913.....	\$3,780		\$3,083		\$31,281	\$10,920	2,247,017
1914.....	49,780		889	\$2,890		42	1,137,152
1915.....	20,035			187,030			301,232
1916.....				1,853			1,853
1917.....		\$20,250					20,250
Totals.....	\$73,595	\$20,250	\$86,062	\$191,773	\$31,281	\$10,962	\$10,140,285

Extra Work Orders Paid, 1903-1917, Inclusive							
1909.....							\$1,373
1910.....							3,693
1911.....							12,375
1912.....							4,600
1913.....							17,279
1914.....							12,793
1915.....	\$260			\$1,290			7,161
1916.....				436			436
Totals.....	\$360			\$1,726			\$59,715

\* The years 1908 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No extra work orders were paid on this section during 1908 and 1917.

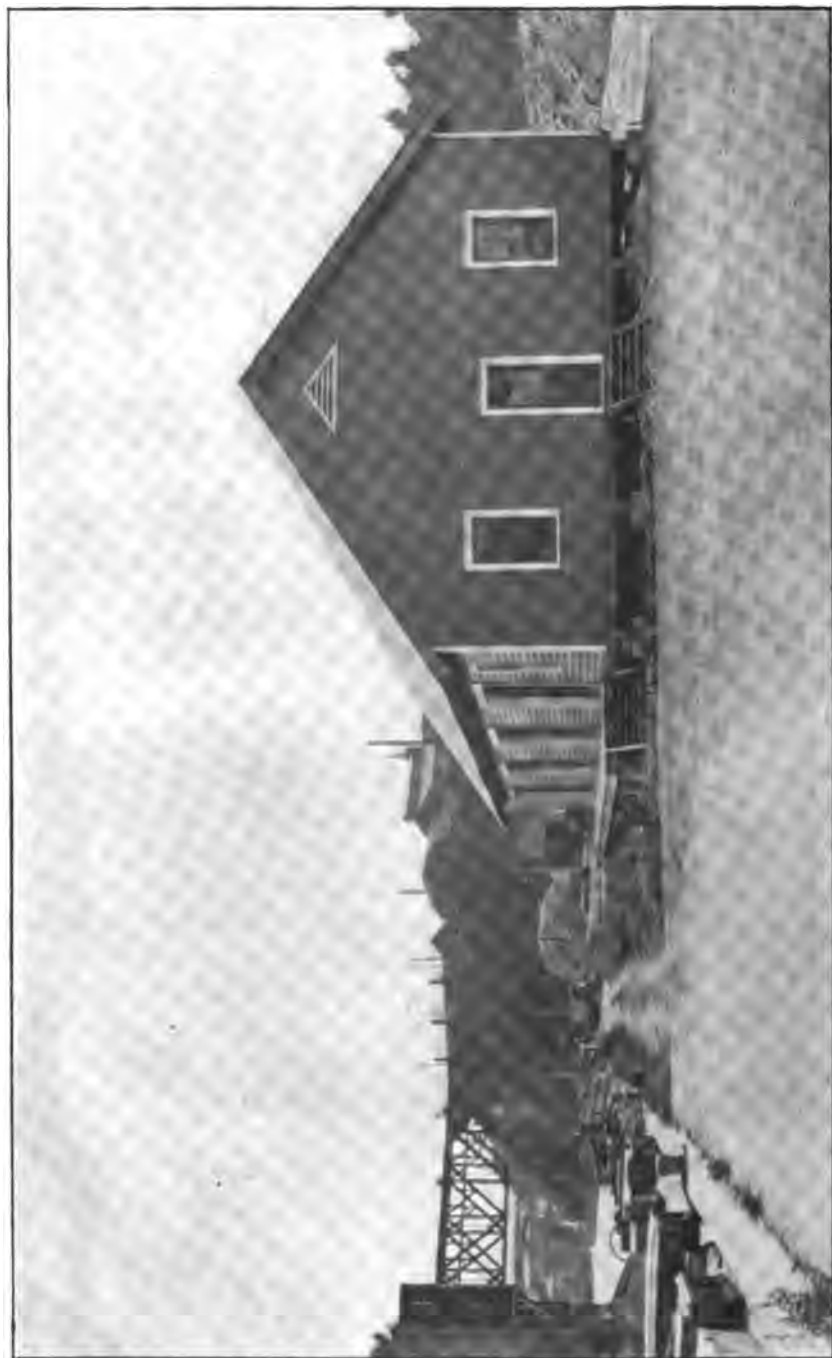
The other sections on which work has been done under certain of the above contracts are as follows: Contract No. 75, section 9, Erie canal; contract No. 94, sections 8 and 9, Erie; contract No. 105, section 9, Erie; contract No. 106, sections 8 and 9, Erie; contract Nos. 112 and 113, section 9, Erie.

### *Terminal Contract No. 210 — Lockport*

This contract provides for the construction of frame warehouses at the upper and lower terminals at Lockport. It was awarded to the Savage Construction Co., of Buffalo, N. Y., being signed on June 1, 1917, and work was begun during the same month. The engineer's preliminary estimate was \$9,955.00, the contractor's bid, \$9,903.00.

H. N. Metzger, Assistant Engineer, is in charge.

Each warehouse has a floor space of 32 by 100 feet. The work was commenced on both houses in June and the house at the upper terminal was nearly finished during the month, while the foundation was completed for the house at the lower terminal.



BARGE CANAL, TERMINAL CONTRACTS NOS. 17 AND 210 — LOCKPORT

General view of the lower terminal at Lockport. The warehouse is one of the larger sizes, being 32 by 100 feet. In the distance the old and new locks and the power-house are seen.



The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Warehouse at Lockport — Upper</i>			
Excavation.....cu. yds.	20	20	100.0
Second-class concrete.....cu. yds.	30	22	73.3
Iron and steel fastenings.....lbs.	350	320	91.4
Painting.....lump sum	\$198	0	0.0
Carpenter work.....lump sum	\$3,998	\$2,998 50	75.0
Electric work.....lump sum	\$198	0	0.0
Total, Lockport — Upper.....	\$4,789 00	\$3,302 50	69.0
<i>Warehouse at Lockport — Lower</i>			
Excavation.....cu. yds.	90	56	62.2
Second-class concrete.....cu. yds.	50	57	114.0
Iron and steel fastenings.....lbs.	350	320	91.4
Painting.....lump sum	\$198	0	0.0
Carpenter work.....lump sum	\$3,998	0	0.0
Electric work.....lump sum	\$198	0	0.0
Total, Lockport — Lower.....	\$5,114 00	\$743 00	14.5
<i>Summary of Contract</i>			
Warehouse at Lockport — Upper.....	\$4,789 00	\$3,302 50	69.0
Warehouse at Lockport — Lower.....	5,114 00	743 00	14.5
Gross estimate at contract prices.....	\$9,903 00	\$4,045 50	40.9

### *Terminal Contract No. 101*

This contract provides for furnishing and installing stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, of Herkimer, N. Y., being signed on December 18, 1916, and on March 26, 1917, it was assigned to the Mohawk Dredge and Dock Company, Inc., of Herkimer, N. Y. The engineer's preliminary estimate for the derrick at Lockport was \$3,477.90, and the contractor's bid, \$5,028.90.

No work has been done on this contract at Lockport this year.

*Construction Work—Barge Canal Terminals*

The Barge canal terminal work done on section 10 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE								Totals
	Contract No. 17	Contract No. 39	Contract No. 50	Contract No. 51	Contract No. 54	Contract No. 206 (section 10)	Contract No. 210	Contract No. 211 (section 10)	
1913.....	\$22,410	.....	.....	.....	.....	.....	.....	.....	\$22,410
1914.....	26,497	.....	.....	.....	.....	.....	.....	.....	26,497
1916.....	.....	.....	\$808	\$1,490	.....	.....	.....	.....	2,298
1917.....	.....	\$2,100	.....	2,873	\$640	\$699	\$4,040	\$2,020	12,372
Totals.....	\$48,907	\$2,100	\$808	\$4,363	\$640	\$699	\$4,040	\$2,020	\$63,577
<i>Extra Work Orders Paid, 1915-1917, Inclusive</i>									
1917.....	.....	.....	.....	\$500	.....	.....	.....	.....	\$500
Totals.....	.....	.....	.....	\$500	.....	.....	.....	.....	\$500

\* The years 1913 and 1914 are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No terminal contract work was done on this section during 1915.

No extra work orders were paid on the contracts on this section during 1913, 1914, 1915 and 1916.

The other sections on which work has been done under certain of the above terminal contracts are as follows: Contract No. 101, sections 1, 4, 5 and 11, Erie canal, and section 3, Champlain; contract No. 206, section 9, Erie; contract No. 209, section 11, Erie; contract No. 211, section 8, Erie.

**ERIE CANAL, RESIDENCY No. 11**

Senior Assistant Engineer B. E. Failing reports:

Residency No. 11 extends from the Sulphur Springs guard-lock at Pendleton to and through the city of Buffalo. Barge canal contracts Nos. 19, 19-A, 83 and 147 and terminal contracts Nos. 21, 47, 53 and 209 are embraced in this residency. Contract No. 19 was finished in the year of 1913. The remaining contracts have been active during the year.

*Contract No. 83*

This contract provides for removing the present dam at Tonawanda, removing the guard-lock and coffer-dam near Sulphur Springs, excavating the prism between Webster street bridge and the west end of contract No. 19-A, and building a retaining wall on the south side of the canal, which will connect the south abutment of the new bridge at Webster street to the south abutment of the old dam.

Considerable engineering field work has been done on this contract and the plans are about finished.

*Contract No. 19-A*

This contract is for redredging, etc., on contract No. 19. It was awarded to H. S. Kerbaugh, Inc., of Buffalo, N. Y., being signed on November 3, 1916. Work was begun in May, 1917. The engineer's preliminary estimate was \$152,200.00, the contractor's bid, \$169,750.10.

R. W. Cady, Assistant Engineer, is in charge.

Between Sulphur Springs guard-lock and the city of Tonawanda the side slopes along Tonawanda creek and the Barge canal were unstable. Heavy rains had caused the slopes to slide and wash into the canal, causing sediment to be deposited above grade. The sliding of the side slopes also caused the failure of the abutments of the New Home bridge and the loss of the highway at Martinsville. Contract No. 19-A provides for redredging contract No. 19, rebuilding the abutments of the New Home bridge, reconstructing the highway at Martinsville and trimming slopes and placing riprap protection where necessary over the extent of this contract.

An extra work order dated January 30, 1917, provides for repairing the temporary supports of the New Home bridge.

During May and June excavation was made and piles were driven for the south abutment of the New Home bridge. Also riprap was placed on the slopes at Martinsville bridge. No prism excavation has been done to date.

Nearly all the work of making repairs to temporary supports of the New Home bridge has been done as provided for under the extra work order dated January 30, 1917.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Excavation.....cu. yds.	308,700	661	0.2
Forming embankment.....cu. yds.	4,200	0	0.0
Lining.....cu. yds.	1,830	0	0.0
Sawed lumber, yellow pine.....ft. B. M.	19,700	0	0.0
Foundation piles.....lin. ft.	7,600	1,801	24.9
Steel sheet-piling.....sq. ft.	3,380	0	0.0

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
Sheeting and bracing.....ft. B. M.	7,500	4,741	63.2
Second-class concrete.....cu. yds.	490	171	34.9
Fourth-class riprap.....cu. yds.	20,800	3,797	18.2
Structural steel.....lbs.	63,100	0	0.0
Metal for repairs to New Home bridge.....lbs.	11,000	0	0.0
Metal reinforcement.....lbs.	340	0	0.0
Wooden fence.....lin. ft.	4,330	0	0.0
Cinder filling.....cu. yds.	2,070	0	0.0
Pumping, bailing, and draining.....lump sum	\$400	\$300	50.0
Placing bridge on new abutments.....lump sum	\$500	0	0.0
Maintaining foot traffic.....lump sum	\$300	0	0.0
Gross estimate at contract prices.....	\$169,750 00	\$9,896 42	5.8

### Contract No. 147

Considerable field and office engineering has been done on this contract, which will provide a bascule bridge over the Tonawanda creek and the new canal at Webster street, Tonawanda.

### Construction Work — Barge Canal

The Barge canal work done on section 11 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE			EXTRA WORK ORDERS PAID		
	Contract No. 19	Contract No. 19-A	Totals	Contract No. 19	Contract No. 19-A	Totals
1907.....	\$20,180		\$20,180			0
1908.....	110,170		110,170	\$300		\$300
1909.....	180,950		180,950	3,738		3,738
1910.....	238,760		238,760	845		845
1911.....	153,070		153,070			0
1912.....	46,560		46,560	7,237		7,237
1913.....	31,750		31,750	12,805		12,805
1914.....	3,846		3,846	14,872		14,872
1917.....		\$9,890	9,890		\$1,460	1,460
Totals.....	\$785,286	\$9,890	\$795,176	\$39,797	\$1,460	\$41,257

\* The years 1907 to 1914, inclusive, are twelve-month periods, ended September 30; and 1917 is a twelve-month period, ended June 30.

NOTE.—No contract work was done on this section during 1915 and 1916.

No extra work orders were paid on these contracts during 1907, 1911, 1915 and 1916.

### Terminal Contract No. 47 — Tonawanda and North Tonawanda

This contract was for constructing terminals at Tonawanda and North Tonawanda. It was awarded to I. M. Ludington's Sons, Inc., of Rochester, N. Y., being signed on October 5, 1915. Work

began in November, 1915. The engineer's preliminary estimate was \$44,660.00, the contractor's bid, \$38,630.00. The contract price as modified by alteration No. 1 was \$38,361.80.

This contract was accepted by the Canal Board October 11, 1916, and the final estimate, amounting to \$36,645.92, was approved November 22, 1916.

O. L. Burdett, Assistant Engineer, was in charge of the work.

The contract provided for increasing the height of dockwall, grading and paving at terminal sites with stone block for a distance of about 800 feet on the north and south sides of the Barge canal, east of the Delaware avenue and Main street bridge at Tonawanda.

Alteration No. 1, approved by the Canal Board September 21, 1916, eliminated the removal of two buildings. It decreased the contract price by \$268.20.

Extra work order dated December 26, 1915, provided for placing tow-line guards on snubbing-posts along dockwall.

The contractors began work in November, 1915, and finished this year. The work done during the year consisted in placing the concrete base and paving blocks.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date (final estimate)	Per cent of work done during year	Per cent, final estimate of contract quantities
Excavation.....cu. yds.	*3,120	5	2,309	0.2	74.0
Embankment.....cu. yds.	1,300	271	769	20.8	59.2
Second-class concrete.....cu. yds.	2,181	569.8	2,056.8	26.1	94.2
Sand cushion.....cu. yds.	597	548	548	91.8	91.8
Stone-block pavement.....sq. yds.	10,486	9,869	9,869	94.1	94.1
Iron castings, plain.....lbs.	8,500	415	8,300	4.9	97.6
Structural steel.....lbs.	10,000	88	9,712	0.9	97.1
Malleable cast-iron nosing.....lin. ft.	1,760	53	1,744	3.0	99.1
Drilling and grouting.....lin. ft.	1,400	2	1,354	0.1	96.7
Second-class concrete (material delivered), cu. yds.	69	76.5	76.5	110.9	110.9
Sand, delivered.....cu. yds.	23	23	23	100.0	100.0
Stone paving block, delivered.....sq. yds.	414	419	419	101.2	101.2
Removing buildings (alteration No. 1) lump sum	\$300	0	\$50	0.0	25.0
Gross estimate at contract prices.....	*\$39,311.80	\$24,890.21	\$36,645.92	63.5	93.5
<i>Extra Work Order</i>					
Dec. 22, 1915.....lump sum	\$256.00	.....	\$256.00	.....	Finished

\* Figures given include an excess quantity authorized by the Canal Board, as follows:

Excavation, 1,700 cu. yds., by resolution dated March 22, 1916.

This quantity at the contract price amounts to \$850.00.



*Terminal Contract No. 209 — Tonawanda and North Tonawanda*

This contract provides for the construction of frame warehouses on the terminal sites at Tonawanda and North Tonawanda. The one at North Tonawanda has a floor space of 24 feet by 100 feet, and the one at Tonawanda, of 32 feet by 80 feet. The contract was awarded to G. J. & P. L. Metzger, of Buffalo, N. Y., being signed on June 4, 1917. Work began the same month. The engineer's preliminary estimate was \$7,892.00, the contractor's bid, \$7,535.00.

R. W. Cady, Assistant Engineer, is in charge.

Work was commenced in June and the foundations for both warehouses were completed during the month.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date	Per cent of work done to date
<i>Tonawanda</i>			
Second-class concrete..... cu. yds.	10	11.5	115.0
Iron and steel fastenings..... lbs.	290	224	77.2
Painting..... lump sum	\$150	0	0.0
Carpenter work..... lump sum	\$3,090	0	0.0
Electric work..... lump sum	\$190	0	0.0
Total for Tonawanda.....	\$3,564 00	\$143 15	4.0
<i>North Tonawanda</i>			
Excavation..... cu. yds.	35	24	68.6
Second-class concrete..... cu. yds.	40	23	70.0
Iron and steel fastenings..... lbs.	290	224	80.0
Painting..... lump sum	\$150	0	0.0
Carpenter work..... lump sum	\$3,140	0	0.0
Electric work..... lump sum	\$198	0	0.0
Total for North Tonawanda.....	\$3,971 00	\$340 40	8.6
<i>Summary of Contract</i>			
Total for Tonawanda.....	\$3,564 00	\$143 15	4.0
Total for North Tonawanda.....	3,971 00	340 40	8.6
Gross estimate at contract prices.....	\$7,535 00	\$483 55	6.4

*Terminal Contract No. 101*

This contract provides for furnishing and installing stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, of Herkimer, N. Y., being signed on December 18, 1916, and was assigned to the Mohawk Dredge and Dock Co., Inc., of Herkimer, N. Y., on March 26, 1917. The engineer's prelimi-

nary estimate for the derrick at Tonawanda was \$3,589.40, the contractor's bid, \$5,140.40.

No work has yet been done on the derrick at Tonawanda.

*Terminal Contract No. 21 — Erie Basin, Buffalo*

This contract is for constructing a terminal at Erie basin, Buffalo. It was awarded to H. S. Kerbaugh, Inc., of New York city, being signed on January 12, 1914. Work was commenced in April, 1914. The engineer's preliminary estimate was \$1,513,925.00, the contractor's bid, \$798,605.80. The contract price as modified by alteration No. 1 is \$801,972.30.

Elias H. Anderson, Assistant Engineer, is in charge.

The contract provides for excavating, to a depth of 23 feet at mean lake level, the entire area of the Erie basin between the New York State breakwater and the shore line (a width of about 900 feet) and extending from the 23-foot channel of the U. S. Government Black Rock harbor improvement southerly about 2,200 feet to the 23-foot entrance of the Buffalo river; also for the construction of two piers, pier No. 1 with a length of 600 feet and pier No. 2 with a length of 400 feet, extending from the shore into Erie basin. These piers are each 150 feet wide and have a clear distance between them of 250 feet. A concrete dockwall is built along the present dock line between the piers and also southerly from pier No. 2 to the present canal slip No. 2 and northerly from pier No. 1 to slip No. 3, the entrance to which is widened.

The contract was modified by alteration No. 1, approved by the Canal Board April 6, 1916, which provided for changing a section of concrete wall, rebuilding tile drain, changing type of fenders, finishing south end of breakwater and placing riprap in front of fire house. It increased the contract price by \$3,366.50.

The work during the year consisted in the building of the concrete walls on top of the timber cribs. The dockwalls were finished with the exception of the steel sheet-piling retaining wall along slip No. 3. Pier No. 1 has been backfilled and the filling of pier No. 2 is in progress. One dipper-dredge has been working during the year stripping and removing the rock excavation. One drill-boat, carrying five drills and drilling three-inch holes, has worked three shifts throughout the year, except four of the winter

months during which time operations were suspended on account of ice in the harbor.

The following table shows the contract quantities, work done during the year and to date, with percentages:

ITEMS OF WORK	Contract quantities as modified by alteration No. 1	Work done during year	Total work done to date	Per cent of work done during year	Per cent of work done to date
Excavation..... cu. yds.	1,123,500	88,678	773,730	7.9	68.9
Sheeting and bracing..... ft. B. M.	30,000	0	0	0.0	0.0
Balast..... cu. yds.	6,380	184	4,730	2.9	74.7
Sawed lumber..... ft. B. M.	2,231,000	40,546	2,113,070	1.8	94.7
Stone filling in cribs..... cu. yds.	36,832	1,835	33,412	5.0	90.7
Foundation piles..... lin. ft.	1,300	1,325	1,325	102.0	102.0
Steel sheet-piling..... sq. ft.	8,820	7,508	7,508	85.1	85.1
Block concrete, second-class..... cu. yds.	1,980	1,881	2,030	97.5	105.2
Second-class concrete..... cu. yds.	2,770	2,628	2,628	91.3	91.3
Reinforced concrete..... cu. yds.	160	37	37	23.1	23.1
Structural steel..... lbs.	197,400	25,376	151,961	12.9	77.0
Metal reinforcement..... lbs.	9,500	2,244	2,244	23.6	23.6
Malleable cast-iron nosing..... lin. ft.	2,960	2,862	2,862	96.7	96.7
Iron castings, plain..... lbs.	21,200	18,774	18,774	88.6	88.6
Fender fastenings..... No.	1,200	760	760	63.3	63.3
Drilling anchor holes in rock..... lin. ft.	310	264	264	85.2	85.2
Clearing wrecks..... hump sum	\$20,000	0	\$20,000	0.0	100.0
First-class concrete..... cu. yds.	3	0	0	0.0	0.0
Riprap..... cu. yds.	2,300	177	177	7.7	7.7
Vitrified tile, 8-in..... lin. ft.	60	56	56	93.3	93.3
Gross estimate at contract prices.....	\$901,972 30	\$120,762 24	\$560,121 41	15.1	69.8

#### *Terminal Contract No. 53 — Ohio Basin, Buffalo*

This contract is for constructing a terminal at Ohio basin, Buffalo. It was awarded to the Walsh Construction Co., of Davenport, Iowa, being signed on October 27, 1916. Construction work began in June, 1917. The engineer's preliminary estimate was \$571,800.00, the contractor's bid, \$532,584.00.

Elwin G. Speyer, Assistant Engineer, is in charge.

The contract provides for constructing a dockwall along Dead creek and around the Ohio basin, dredging the basin 20 feet deep and constructing a bascule bridge across Dead creek at Ohio street, in the city of Buffalo.

The work was commenced in June and consisted mainly in excavating. Four dump-scows with a capacity of about 480 cu. yds. each, one tug and one dipper-dredge, handling a 5-yard dipper, is the plant on excavation. One traveling derrick, one wooden scow and one floating pile-driver have been received on the work.

The following table shows the contract quantities and work done, with percentages:

ITEMS OF WORK		Contract quantities	Total work done to date	Per cent of work done to date
Removal of existing timber docking.....	lump sum	\$2,200	\$440	20.0
Removal of northerly abutment.....	lump sum	\$1,800	0	0.0
Removal and repairs to Erie freight-house.....	lump sum	\$500	0	0.0
Underpinning buildings.....	lump sum	\$500	0	0.0
Bracing and protection of Erie Railroad Company's tracks.....	lump sum	\$1,800	0	0.0
Coffer-dams, pumping, bailing and draining.....	lump sum	\$136,000	0	0.0
Excavation.....	cu. yds.	245,000	32,371	13.2
Sheeting and bracing.....	ft. B. M.	10,000	0	0.0
Forming embankment.....	cu. yds.	60,000	0	0.0
Foundation piles.....	lin. ft.	700	0	0.0
Sawed lumber.....	ft. B. M.	12,000	0	0.0
Sawed lumber, treated.....	ft. B. M.	62,000	0	0.0
Wooden fence.....	lin. ft.	60	0	0.0
Second-class concrete.....	cu. yds.	32,800	0	0.0
Second-class reinforced concrete.....	cu. yds.	1,570	0	0.0
Operator's cabin.....	lump sum	\$2,500	0	0.0
Laying cast-iron pipe and specials.....	lin. ft.	70	0	0.0
Tile and stone drains.....	lin. ft.	5,300	0	0.0
Metal duct.....	lbs.	2,700	0	0.0
Structural steel.....	lbs.	340,000	0	0.0
Iron castings, plain.....	lbs.	41,000	0	0.0
Machinery.....	lbs.	63,000	0	0.0
Hand-operated safety gate.....	lump sum	\$300	0	0.0
Malleable cast-iron nosing.....	lin. ft.	3,800	0	0.0
Metal reinforcement.....	lbs.	49,000	0	0.0
Fender fastenings.....	No.	660	0	0.0
Steel sheet-piling.....	sq. ft.	4,800	0	0.0
Pipe railing.....	lin. ft.	3,700	0	0.0
Pig iron.....	lbs.	20,000	0	0.0
Metal railing.....	lin. ft.	100	0	0.0
Electrical equipment.....	lump sum	\$6,000	0	0.0
Broken stone or gravel surfacing.....	cu. yds.	2,500	0	0.0
Concrete curb and edging.....	lin. ft.	240	0	0.0
Concrete sidewalk.....	sq. ft.	900	0	0.0
Relaying stone-block pavement.....	sq. yds.	950	0	0.0
Wood-block pavement.....	sq. yds.	212	0	0.0
Asphalt pavement.....	sq. yds.	550	0	0.0
Plumbing.....	lump sum	\$600	0	0.0
Maintaining navigation.....	lump sum	\$3,000	\$300	10.0
Maintaining highway traffic.....	lump sum	\$6,000	0	0.0
Deduct for existing bridge superstructure to be removed.....	lump sum	\$500	0	0.0
Gross estimate at contract prices.....		\$532,584 00	\$11,098 72	2.1

### Construction Work — Barge Canal Terminals

The Barge canal terminal work done on section 11 of the Erie canal is summarized by years and contracts in the following table:

YEAR *	VALUE OF WORK DONE				
	Contract No. 21	Contract No. 47	Contract No. 53	Contract No. 209	Totals
1914.....	\$136,190				\$136,190
1915.....	202,990				202,990
1916.....	100,170	\$11,750			111,920
1917.....	120,770	24,896	\$11,090	\$490	157,236
Totals.....	\$560,120	\$36,646	\$11,090	\$490	\$608,336
<i>Extra Work Orders Paid, 1914-1917, Inclusive</i>					
1917.....		\$256			\$256
Totals.....		\$256			\$256

\* The years 1914 and 1915 are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

NOTE.— No extra work orders were paid on the contracts in this section during 1914, 1915 and 1916. Under terminal contract No. 209 work has also been done on section 10, Erie canal.

*Road "N," adjacent to Contract No. 19*

This contract was let to William L. O'Day, of Buffalo, N. Y., on September 5, 1914, the contract price being \$4,455.50. The work consisted in constructing a road on the southerly side of the Erie canal from Sulphur Springs bridge to May's bridge, also a road on the northerly side of the Erie canal from Pendleton bridge westerly about 700 feet, in the town of Pendleton, Niagara county.

No work was done by the contractor during the year. The surface of the road was left very rough and irregular and was not accepted on this account until the Superintendent of Public Works had placed the surface of the road in an acceptable condition. The contract was finished by the Superintendent of Public Works after the contractor had on several occasions refused to do the necessary work requested of him.

The following table shows the contract and final estimate quantities, with percentages:

ITEMS OF WORK	Contract quantities	Total work done to date (final estimate)	Per cent, final estimate of contract quantities
Clearing..... lump sum	\$55	\$55	100.0
Excavation..... cu. yds.	2,350	2,815	98.8
Forming embankment..... cu. yds.	1,950	1,561	80.1
Lining..... cu. yds.	1,070	1,069	99.9
Sawed lumber, hemlock..... ft. B. M.	1,000	144	14.4
Wooden fence..... lin. ft.	650	118	18.1
Gross estimate at contract prices.....	\$4,455 50	\$4,188 14	94.0

## CONCLUSION

A statement of the engineering expenses of the Division and table of contracts pending, as well as those completed during the fiscal year, are appended to this report.

In closing I would like to acknowledge the coöperation of all the men in the engineering force on the Division. Through the coöperation of the engineering forces, plans have been advanced for completing the canal, so that its opening appears certain at no distant date.

Respectfully submitted,

F. P. WILLIAMS,

*Division Engineer.*

# WESTERN DIVISION: ENGINEERING EXPENSES 341

THE FOLLOWING STATEMENTS SHOW THE NAME, RANK AND COMPENSATION OF ENGINEERS IN THE WESTERN DIVISION OF THE DEPARTMENT OF STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED JUNE 30, 1917.

## Ordinary Repairs to Canals—Erie Canal

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
F. P. Williams	Division engineer	\$4,800 per year	\$4,800 00	\$533 24	\$5,333 24
Waldo G. Wildes	Senior assistant engineer	3,300 per year	2,946 67		2,946 67
Anna M. Lorscheider	Stenographer	1,350 per year	1,350 00		1,350 00
L. John Long	Junior assistant engineer	1,200 per year	3 33		3 33
<i>Incidental Expenses</i>			\$9,100 00	\$533 24	\$9,633 24
Stationery and printing				\$75 89	
Postage				35 35	
Telephone and telegraph				86 35	
Miscellaneous				169 17	
					366 76
Total					\$10,000 00

## Construction of Barge Canal—Erie Canal

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
Waldo G. Wildes	Senior assistant engineer	\$3,300 per year	\$128 33	\$37 67	\$166 00
Edward Anderberg	Senior assistant engineer	2,820 per year	68 48	81 63	150 11
B. E. Failing	Senior assistant engineer	3,060 per year	1,257 50	72 47	1,329 97
L. S. Hulburd	Senior assistant engineer	3,060 per year	2,862 00	137 11	2,999 71
A. R. Morse	Senior assistant engineer	2,820 per year	2,553 00	11 36	2,564 36
A. E. Steere	Senior assistant engineer	3,060 per year	1,143 46	59 76	1,203 22
Lewis A. Keil	Cashier	1,800 per year	1,800 00	33 78	1,833 78
Frank V. Searls	Estimate clerk	1,800 per year	1,606 45		1,606 45
Edith S. Fogle	Stenographer	\$99 96 per year	491 65		491 65
W. D. Gartland	Stenographer	1,200 per year	273 33		273 33
Victor M. O'Neill	Stenographer	\$99 96 per year	99 96		99 96
Elizabeth S. White	Stenographer	\$99 96 per year	999 96		999 96
C. L. Baldwin	Assistant engineer	2,340 per year	2,237 00	72 92	2,309 92
D. E. Bellows	Assistant engineer	2,340 per year	2,398 00	715 82	3,113 82
W. W. Brown	Assistant engineer	1,980 per year	2,007 00	1 00	2,008 00
O. L. Burdett	Assistant engineer	2,340 per year	688 35	237 48	925 83
R. W. Cady	Assistant engineer	2,208 per year	552 00	21 10	573 10
R. D. Cameron	Assistant engineer	1,980 per year	1,647 00		1,647 00
C. R. De Graff	Assistant engineer	2,208 per year	417 90	4 25	422 15
Gordon Edson	Assistant engineer	2,340 per year	2,314 00	23 71	2,337 71
C. E. Elmendorf	Assistant engineer	2,340 per year	497 00	28 25	525 25
L. G. Fisher	Assistant engineer	2,208 per year	1,882 00	62 18	1,944 18
F. W. Madigan	Assistant engineer	2,340 per year	2,058 00	601 23	2,659 23
Frank T. Marsh	Assistant engineer	2,208 per year	2,190 00	119 92	2,309 92
H. N. Metzger	Assistant engineer	2,208 per year	385 51	162 93	548 44
A. S. Milinowski	Assistant engineer	2,208 per year	1,097 93	148 97	1,246 90
Lester P. Slade	Assistant engineer	1,980 per year	1,882 00		1,882 00
Elwin G. Speyer	Assistant engineer	2,208 per year	871 84	192 50	1,064 34
J. Seward Summers	Assistant engineer	2,340 per year	2,293 00	50 41	2,343 41
Arthur S. Whitbeck	Assistant engineer	2,340 per year	2,020 00	120 28	2,140 28
F. J. Wilbur	Assistant engineer	2,340 per year	2,237 00		2,237 00
R. W. Anderson	Junior assistant engineer	1,320 per year	304 33		304 33
E. C. Ansley	Junior assistant engineer	1,560 per year	372 67	6 97	379 64

*Construction of Barge Canal—Erie Canal—(Continued)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
David Arbeit.....	Junior assistant engineer.....	\$1,200 per year	\$103 23		\$103 23
Morris Berkenblit.....	Junior assistant engineer.....	1,110 per year	965 56		965 56
David L. Breinin.....	Junior assistant engineer.....	1,200 per year	265 40		265 40
H. A. Brown.....	Junior assistant engineer.....	1,200 per year	122 58		122 58
W. F. Burke.....	Junior assistant engineer.....	1,200 per year	86 67		86 67
W. J. Burns.....	Junior assistant engineer.....	1,680 per year	1,125 00		1,125 00
A. B. Chappell.....	Junior assistant engineer.....	1,560 per year	890 00		890 00
E. A. Close.....	Junior assistant engineer.....	1,440 per year	300 00		300 00
Clarence M. Colony.....	Junior assistant engineer.....	1,440 per year	1,148 00	\$5 45	1,153 45
Jay Conger, Jr.....	Junior assistant engineer.....	1,080 per year	366 87		366 87
J. F. Cullen.....	Junior assistant engineer.....	1,110 per year	956 85		956 85
Thomas L. Curtin.....	Junior assistant engineer.....	1,110 per year	506 85		506 85
B. S. Davenport.....	Junior assistant engineer.....	1,320 per year	690 32		690 32
Edward J. Donlon.....	Junior assistant engineer.....	1,110 per year	721 89		721 89
Earle E. R. Dornbach.....	Junior assistant engineer.....	1,110 per year	956 85		956 85
Philip Drabkin.....	Junior assistant engineer.....	1,110 per year	785 27		785 27
John J. Dunne.....	Junior assistant engineer.....	1,110 per year	877 50		877 50
J. R. Eckhardt.....	Junior assistant engineer.....	1,560 per year	1,160 00		1,160 00
Louis Englowitz.....	Junior assistant engineer.....	1,110 per year	854 60		854 60
Fred C. Faer.....	Junior assistant engineer.....	1,680 per year	1,720 00		1,720 00
W. H. Ginnity.....	Junior assistant engineer.....	1,560 per year	970 00		970 00
George Gordon.....	Junior assistant engineer.....	1,080 per year	119 03		119 03
W. B. Green.....	Junior assistant engineer.....	1,320 per year	1,282 00		1,282 00
Chas. E. Heydt.....	Junior assistant engineer.....	1,320 per year	863 68		863 68
Jos. W. Howe.....	Junior assistant engineer.....	1,440 per year	1,168 00		1,168 00
H. A. Ingersoll.....	Junior assistant engineer.....	1,440 per year	728 00		728 00
Fred G. Kimball.....	Junior assistant engineer.....	1,320 per year	1,190 00		1,190 00
Louis Koteras.....	Junior assistant engineer.....	1,320 per year	1,078 00		1,078 00
Michael Kovar.....	Junior assistant engineer.....	1,110 per year	277 50		277 50
John P. Lacey.....	Junior assistant engineer.....	1,080 per year	63 87		63 87
J. F. Larney.....	Junior assistant engineer.....	1,110 per year	277 50		277 50
Wm. M. J. Lewis.....	Junior assistant engineer.....	1,440 per year	170 32		170 32
L. John Long.....	Junior assistant engineer.....	1,200 per year	324 67	16 78	341 45
Frank J. McMahon.....	Junior assistant engineer.....	1,200 per year	100 00		100 00
S. A. Miller.....	Junior assistant engineer.....	1,440 per year	1,291 50		1,291 50
W. R. Miller.....	Junior assistant engineer.....	1,320 per year	1,148 00		1,148 00
Dana M. Miner.....	Junior assistant engineer.....	1,680 per year	1,595 00		1,595 00
Abraham Oster.....	Junior assistant engineer.....	1,110 per year	366 59		366 59
O. J. Pierce.....	Junior assistant engineer.....	1,320 per year	1,306 00		1,306 00
Earl Polmateer.....	Junior assistant engineer.....	1,200 per year	125 81		125 81
Garson Prenner.....	Junior assistant engineer.....	1,200 per year	330 00		330 00
W. W. Redfern.....	Junior assistant engineer.....	1,110 per year	21 58		21 58
Harry Rubin.....	Junior assistant engineer.....	1,110 per year	895 50		895 50
Daniel Salmon.....	Junior assistant engineer.....	1,200 per year	109 68		109 68
Simon Saperstein.....	Junior assistant engineer.....	1,110 per year	930 73		930 73
M. B. Severance.....	Junior assistant engineer.....	1,440 per year	315 87	7 21	323 08
D. T. Simpson.....	Junior assistant engineer.....	1,560 per year	747 36	76 70	824 06
J. A. Sloat.....	Junior assistant engineer.....	1,680 per year	392 00	48 65	440 65
Jacob Smertenko.....	Junior assistant engineer.....	1,110 per year	878 95		878 95
Tracy B. Smith.....	Junior assistant engineer.....	1,680 per year	716 00		716 00
C. J. Sullivan.....	Junior assistant engineer.....	1,320 per year	249 83		249 83
J. R. Tighe.....	Junior assistant engineer.....	1,320 per year	330 00		330 00
H. R. Topping.....	Junior assistant engineer.....	1,680 per year	580 67		580 67
Harry J. Turner.....	Junior assistant engineer.....	1,110 per year	78 86		78 86
Powell Wall.....	Junior assistant engineer.....	1,560 per year	377 16		377 16
H. J. Whitman.....	Junior assistant engineer.....	1,680 per year	1,595 00		1,595 00
S. E. Whitney.....	Junior assistant engineer.....	1,200 per year	112 90		112 90
E. N. Woodward.....	Junior assistant engineer.....	1,200 per year	713 33		713 33
W. J. Zabel.....	Junior assistant engineer.....	1,440 per year	1,188 00	7 70	1,195 70
Charles R. Zorsch.....	Junior assistant engineer.....	1,680 per year	745 00		745 00
Guy L. Smith.....	Leveler.....	4 50 per day	9 00		9 00
C. S. Diets.....	Rodman.....	4 00 per day	584 00		584 00
A. W. Holmes.....	Rodman.....	4 00 per day	480 00		480 00
Thomas E. McGrath.....	Rodman.....	3 50 per day	297 50		297 50
Lynn H. Barrows.....	Engineering assistant.....	1,020 per year	504 79		504 79
Theophilus Beaupre.....	Engineering assistant.....	960 per year	754 00		754 00
Reginald S. Brackett.....	Engineering assistant.....	840 per year	9 33		9 33
E. J. Bullis.....	Engineering assistant.....	960 per year	945 00		945 00
Harry Coniff.....	Engineering assistant.....	960 per year	393 00		393 00
E. J. Greiner.....	Engineering assistant.....	960 per year	783 00		783 00
F. G. Hempel.....	Engineering assistant.....	960 per year	342 00	22 85	364 85
P. M. Howe.....	Engineering assistant.....	960 per year	354 00		354 00
W. F. Lysett.....	Engineering assistant.....	1,020 per year	442 29		442 29

*Construction of Barge Canal—Erie Canal—(Concluded)*

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
F. B. McLean.....	Engineering assistant.....	\$840 per year	\$11 67		\$11 67
Edward J. Moran.....	Engineering assistant.....	840 per year	37 34		37 34
F. J. O'Connor.....	Engineering assistant.....	1,020 per year	996 00		996 00
L. T. Phillips.....	Engineering assistant.....	1,020 per year	972 00		972 00
Wm. H. Saunders.....	Engineering assistant.....	960 per year	152 66		152 66
Frank M. Sisson.....	Engineering assistant.....	960 per year	624 00		624 00
Michael Bebarfald.....	Chainman.....	2 50 per day	87 50		87 50
J. E. Conerty.....	Chainman.....	2 50 per day	120 00		120 00
M. G. Larkin.....	Chainman.....	2 50 per day	150 00		150 00
Hugh J. Weir.....	Chainman.....	3 00 per day	177 00		177 00
H. B. Finan.....	Inspector of engineering works.....	1,560 per year	1,680 00		1,680 00
Geo. M. Harter.....	Inspector of engineering works.....	1,560 per year	860 33		860 33
C. M. Leet.....	Inspector of engineering works.....	1,560 per year	1,340 00		1,340 00
James Sim.....	Inspector of engineering works.....	1,560 per year	390 00		390 00
W. A. Walter.....	Inspector of engineering works.....	1,560 per year	294 67		294 67
Carl F. Doty.....	Boatman.....	2 00 per day	198 00		198 00
John Hano.....	Boatman.....	3 00 per day	966 00		966 00
C. Kumro.....	Boatman.....	3 00 per day	489 00		489 00
J. H. McCabe.....	Boatman.....	3 00 per day	93 00		93 00
John Riley.....	Boatman.....	3 00 per day	309 00		309 00
Richard Stanton.....	Boatman.....	3 00 per day	351 00		351 00
Joseph H. Stutson.....	Boatman.....	3 00 per day	946 00		946 00
H. Kimball Benedict.....	Laborer.....	2 50 per day	163 00		163 00
Wm. A. Brick.....	Laborer.....	2 50 per day	368 50		368 50
Wm. A. Bright.....	Laborer.....	2 50 per day	170 00		170 00
Paul Buck.....	Laborer.....	2 50 per day	37 50		37 50
Ernest Budlong.....	Laborer.....	2 00 per day	476 00		476 00
C. J. Collins.....	Laborer.....	2 00 per day	146 00		146 00
James Eldridge.....	Laborer.....	2 00 per day	52 00		52 00
H. J. Flak.....	Laborer.....	2 50 per day	152 50		152 50
Raymond J. Golding.....	Laborer.....	2 50 per day	520 00		520 00
Ernest F. Hamilton.....	Laborer.....	2 50 per day	120 00		120 00
Smith Hulburt.....	Laborer.....	2 50 per day	667 50		667 50
Henry J. Killian.....	Laborer.....	2 50 per day	331 00		331 00
Arthur Knapp.....	Laborer.....	2 50 per day	610 50		610 50
Edwin Krapf.....	Laborer.....	2 50 per day	570 00		570 00
Lester Lavine.....	Laborer.....	2 50 per day	682 00		682 00
Fred S. Lewis.....	Laborer.....	2 50 per day	527 00		527 00
Raymond M. Lynd.....	Laborer.....	2 50 per day	134 00		134 00
Nelson Mullen.....	Laborer.....	2 00 per day	70 00		70 00
Edward F. Murr.....	Laborer.....	2 50 per day	520 00		520 00
G. A. Nusbaum.....	Laborer.....	2 50 per day	226 50		226 50
Matthew Rigney.....	Laborer.....	2 00 per day	72 00		72 00
Raymond J. Riley.....	Laborer.....	2 50 per day	135 00		135 00
W. H. Rundle.....	Laborer.....	2 50 per day	65 00		65 00
E. B. Ryan.....	Laborer.....	2 00 per day	52 00		52 00
James Spillman.....	Laborer.....	2 50 per day	165 00		165 00
Elmer R. Stoll.....	Laborer.....	2 50 per day	165 00		165 00
C. O. Stone.....	Laborer.....	2 00 per day	52 00		52 00
Lewis Van Allan.....	Laborer.....	2 50 per day	180 00		180 00
E. R. Weed.....	Laborer.....	2 50 per day	631 50		631 50
George H. Yerkes.....	Laborer.....	2 50 per day	579 50		579 50
John J. Nugent.....	Chauffeur.....	1,380 per year	1,328 22	\$80 35	1,408 57
E. Quans.....	Office assistant.....	1,020 per year	954 00		954 00
A. C. Scott.....	Junior engineer.....	1,440 per year	150 97		150 97
J. Horton Begy.....	Gage reader.....	120 per year	10 00		10 00
H. K. Compton.....	Gage reader.....	84 per year	82 65		82 65
C. H. Harrison.....	Gage reader.....	60 per year	60 00		60 00
Patrick J. Slavin.....	Gage reader.....	60 per year	60 00		60 00
Homer Snell.....	Gage reader.....	72 per year	72 00		72 00
Carl Tuscher.....	Gage reader.....	60 per year	60 00		60 00
			\$113,316 00	\$3,269 99	\$116,585 99
<i>Incidental Expenses</i>					
Instruments and tools.....				\$213 09	
Office rent.....				3,340 00	
Fuel and light.....				176 30	
Stationery and printing.....				422 24	
Postage.....				220 30	
Telephone and telegraph.....				970 02	
Miscellaneous.....				5,860 81	
					11,202 76
Total.....					\$127,788 75



*Construction of Barge Canal Terminals*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
B. E. Failing	Senior assistant engineer	\$3,060 per year	\$1,205 00	\$24 46	\$1,229 46
L. S. Hulburd	Senior assistant engineer	3,060 per year	280 50	2 60	283 10
A. E. Steere	Senior assistant engineer	3,060 per year	17 00		17 00
Waldo G. Wildes	Resident engineer	3,000 per year		4 33	4 33
Frank V. Searls	Estimate clerk	1,800 per year	43 55		43 55
Edith S. Fogle	Stenographer	\$99 96 per year	491 65		491 65
W. J. Burns	Engineering draftsman	5 00 per day	25 00		25 00
J. R. Eckhardt	Engineering draftsman	5 00 per day	50 00		50 00
Louis Koterwas	Engineering draftsman	4 00 per day	76 00		76 00
Tracy B. Smith	Engineering draftsman	5 00 per day	275 00		275 00
Charles R. Zorsch	Engineering draftsman	5 00 per day	320 00		320 00
Elias H. Anderson	Assistant engineer	2,340 per year	2,174 00	18 11	2,192 11
O. L. Burdett	Assistant engineer	7 00 per day	882 00	26 25	908 25
R. D. Cameron	Assistant engineer	6 00 per day	270 00		270 00
C. E. Elmendorf	Assistant engineer	2,340 per year	1,733 00	12 80	1,745 80
L. G. Fisher	Assistant engineer	7 00 per day	98 00		98 00
F. W. Madigan	Assistant engineer	2,340 per year	151 00		151 00
H. N. Metzger	Assistant engineer	2,208 per year	253 83	85 72	339 55
A. S. Milinowski	Assistant engineer	2,208 per year	56 07	8 30	64 37
Elwin G. Speyer	Assistant engineer	2,208 per year	653 29	190 77	844 06
C. J. Bean	Junior assistant engineer	1,680 per year	1,595 00		1,595 00
E. A. Close	Junior assistant engineer	1,440 per year	1,004 00		1,004 00
Edward J. Donlon	Junior assistant engineer	1,080 per year	5 81		5 81
Walter G. Dubey	Junior assistant engineer	1,320 per year	1,270 00		1,270 00
Philip Drabkin	Junior assistant engineer	1,030 per year	9 00		9 00
Charles E. Heydt	Junior assistant engineer	1,320 per year	170 32		170 32
H. A. Ingersoll	Junior assistant engineer	1,440 per year	108 00		108 00
Abraham Oster	Junior assistant engineer	1,110 per year	321 89		321 89
W. W. Redfern	Junior assistant engineer	1,110 per year	255 92		255 92
Thomas F. Riley, Jr.	Junior assistant engineer	1,080 per year	30 00		30 00
Simon Saperstein	Junior assistant engineer	1,080 per year	156 77		156 77
M. B. Severance	Junior assistant engineer	1,440 per year	681 16		681 16
D. T. Simpson	Junior assistant engineer	1,560 per year	681 67	45	682 12
J. A. Sloot	Junior assistant engineer	1,680 per year	28 00		28 00
Jacob Smertenko	Junior assistant engineer	1,030 per year	92 42		92 42
I. L. Stalker	Junior assistant engineer	1,320 per year	1,184 19		1,184 19
C. J. Sullivan	Junior assistant engineer	1,320 per year	62 33		62 33
Harry J. Turner	Junior assistant engineer	1,110 per year	180 21		180 21
Powell Wall	Junior assistant engineer	1,560 per year	388 63		388 63
Guy L. Smith	Leveeler	4 50 per day	400 50		400 50
B. S. Davenport	Rodman	4 00 per day	316 00		316 00
A. W. Holmes	Rodman	4 00 per day	12 00		12 00
J. W. Howe	Rodman	4 00 per day	144 00		144 00
Thomas E. McGrath	Rodman	3 50 per day	10 50		10 50
W. J. Zabel	Rodman	4 00 per day	132 00		132 00
Lynn H. Barrows	Engineering assistant	1,020 per year	256 00		256 00
Reginald S. Brackett	Engineering assistant	840 per year	32 67		32 67
F. B. McLean	Engineering assistant	840 per year	198 33		198 33
Edward J. Moran	Engineering assistant	840 per year	240 16		240 16
William H. Saunders	Engineering assistant	960 per year	59 34		59 34
H. J. Weir	Engineering assistant	960 per year	771 00		771 00
J. E. Conerty	Chainman	2 50 per day	25 00		25 00
E. J. Greiner	Chainman	3 00 per day	177 00		177 00
W. F. Lysett	Chainman	3 00 per day	348 00		348 00
F. M. Sisson	Chainman	3 00 per day	339 00		339 00
J. W. Wilson	Chainman	3 00 per day	168 00		168 00
George M. Harrer	Inspector of engineering works	1,560 per year	584 67		584 67
C. M. Leet	Inspector of engineering works	1,560 per year	235 00		235 00
Edgar W. Fennie	Boatman	3 00 per day	939 00		939 00
John Hano	Boatman	3 00 per day	9 00		9 00
C. Kumro	Boatman	3 00 per day	270 00		270 00
John Riley	Boatman	3 00 per day	51 00		51 00
William A. Brick	Laborer	2 50 per day	197 00		197 00
Paul Buck	Laborer	2 50 per day	206 50		206 50
H. J. Killiam	Laborer	2 00 per day	310 00		310 00
Arthur Knapp	Laborer	2 50 per day	58 50		58 50
Edwin Krapf	Laborer	2 00 per day	90 00		90 00
David R. Petrikin	Laborer	2 50 per day	180 00		180 00
W. H. Rundie	Laborer	2 50 per day	227 00		227 00

*Construction of Barge Canal Terminals— (Continued)*

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	Services	Travel	Total
John Zingierski.....	Laborer.....	\$2 50 per day	\$236 50		\$236 50
Charles F. Keale, Jr.....	Junior engineer.....	1,440 per year	4 00		4 00
<i>Incidental Expenses</i>			\$24,507 88	\$373 79	\$24,881 67
Instruments and tools.....				\$8 57	
Office rent.....				1,000 00	
Fuel and light.....				35 14	
Stationery and printing.....				2 60	
Postage.....				25 62	
Telephone and telegraph.....				122 06	
Express and freight.....				14 74	
Miscellaneous.....				800 03	
					2,008 76
Total.....					\$26,890 43

*Chemung River Improvement*

Chapter 732, Laws of 1913; chapter 728, Laws of 1915

NAME	Rank	Rate of compensation	Services	Travel	Total
F. P. Williams.....	Division Engineer.....	\$4,800 per year		\$9 81	\$9 81
H. R. Topping.....	Leveler.....	4 50 per day	\$4 50	3 15	7 65
John J. Nugent.....	Chauffeur.....	1,380 per year		8 40	8 40
<i>Incidental Expenses</i>			\$4 50	\$21 36	\$25 86
Miscellaneous.....					10 80
Total.....					\$36 66

*Canistota River Improvement*

Chapter 750, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917

NAME	Rank	Rate of compensation	Services	Travel	Total
F. P. Williams.....	Division engineer.....	\$4,800 per year		\$10 50	\$10 50
Waldo G. Wildes.....	Senior assistant engineer.....	3,300 per year		39 46	39 46
J. R. Eckhardt.....	Engineering draftsman.....	5 00 per day	\$200 00		200 00
Louis Koterwas.....	Engineering draftsman.....	4 00 per day	60 00		60 00
Frank T. Marsh.....	Assistant engineer.....	7 00 per day	7 00	5 14	12 14
W. B. Ginnity.....	Leveler.....	5 00 per day	60 00		60 00
I. Grossman.....	Junior assistant engineer.....	1,090 per year	473 22		473 22
W. R. Miller.....	Junior assistant engineer.....	1,320 per year	110 00		110 00
Tracy B. Smith.....	Junior assistant engineer.....	1,680 per year	84 00		84 00
H. R. Topping.....	Junior assistant engineer.....	1,680 per year	1,054 33	87 90	1,142 23
Charles R. Zorsch.....	Junior assistant engineer.....	1,680 per year	140 00		140 00
L. John Long.....	Rodman.....	3 50 per day	150 50		150 50
Harry Coniff.....	Chainman.....	3 00 per day	522 00		522 00
John J. Nugent.....	Chauffeur.....	1,380 per year		17 19	17 19
Kossuth Swartwood.....	Laborer.....	2 00 per day	412 00		412 00
<i>Incidental Expenses</i>			\$3,273 05	\$160 19	\$3,433 24
Stationery and printing.....				\$0 25	
Livery.....				54 00	
Postage.....				7 71	
Telephone and telegraph.....				1 00	
Miscellaneous.....				31 10	
					94 06
Total.....					\$3,527 30

## REPORT OF STATE ENGINEER

*Chadakoin River Improvement*

Chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917

NAME	Rank	Rate of compensation	Services	Travel	Total
F. P. Williams .....	Division engineer .....	\$4,800 per year .....		\$13 85	\$13 85
B. E. Failing .....	Resident engineer .....	3,000 per year .....	\$175 00	33 10	208 10
C. R. DeGraff .....	Assistant engineer .....	2,208 per year .....	1,800 10	30 19	1,830 29
Frank T. Marsh .....	Assistant engineer .....	7 00 per day .....	7 00	8 21	15 21
Powell Wall .....	Leveller .....	4 50 per day .....	13 50		13 50
Charles F. Keale, Jr. ....	Junior engineer .....	1,440 per year .....	392 90		392 90
John J. Nugent .....	Chauffeur .....	1,200 per year .....		4 15	4 15
Thomas L. Curtin .....	Junior assistant engineer .....	1,080 per year .....	563 23		563 23
Harry J. Turner .....	Junior assistant engineer .....	1,110 per year .....	2 98		2 98
John Zingierski .....	Laborer .....	2 50 per day .....	2 50		2 50
Horace S. Butts .....	Gage reader .....	120 per year .....	120 00		120 00
<i>Incidental Expenses</i>			\$3,077 21	\$89 50	\$3,166 71
Postage .....				\$1 70	
Telephone and telegraph .....				2 06	
Miscellaneous .....				27 37	
Total .....					\$1 12
Total .....					\$3,197 84

*Ellicott Creek Improvement*

Chapter 624, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917

NAME	Rank	Rate of compensation	Services	Travel	Total
O. L. Burdett .....	Assistant engineer .....	\$7 00 per day .....	\$84 00		\$84 00
Elwin G. Speyer .....	Assistant engineer .....	6 00 per day .....	36 00		36 00
H. A. Ingersoll .....	Rodman .....	4 00 per day .....	40 00		40 00
Abraham Oster .....	Junior assistant engineer .....	1,080 per year .....	23 32		23 32
Thomas F. Riley, Jr. ....	Junior assistant engineer .....	1,080 per year .....	20 32		20 32
Lynn H. Barrows .....	Chainman .....	2 50 per day .....	15 00		15 00
W. F. Lysett .....	Chainman .....	3 00 per day .....	18 00		18 00
C. Kumro .....	Boatman .....	3 00 per day .....	18 00		18 00
William A. Brick .....	Laborer .....	2 00 per day .....	12 00		12 00
<i>Incidental Expenses</i>			\$266 64		\$266 64
Stationery and printing .....					54 35
Total .....					\$320 99

*Surveys for State Court of Claims*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
B. E. Failing.....	Resident Engineer.....	\$3,000 per year	\$125 00	\$10 41	\$135 41
Elías H. Anderson.....	Assistant engineer.....	7 00 per day	70 00	90	70 90
C. E. Elmendorf.....	Assistant engineer.....	7 00 per day	14 00		14 00
L. G. Fisher.....	Assistant engineer.....	7 00 per day	7 00		7 00
A. S. Milinowski.....	Assistant engineer.....	7 00 per day	147 00	8 76	150 76
Elwin G. Speyer.....	Assistant engineer.....	7 00 per day	261 00	282 37	543 37
J. S. Summers.....	Assistant engineer.....	7 00 per day	56 00	19 19	75 19
C. H. Swick.....	Assistant engineer.....	7 00 per day	14 00	7 84	21 84
Arthur S. Whitbeck.....	Assistant engineer.....	7 00 per day	154 00	96 62	250 62
Fred C. Facer.....	Leveler.....	5 00 per day	5 00		5 00
H. R. Topping.....	Leveler.....	5 00 per day	27 50	23 60	51 10
Powell Wall.....	Leveler.....	5 00 per day	222 50		222 50
C. M. Colony.....	Rodman.....	4 00 per day	172 00	78	172 78
H. A. Ingersoll.....	Rodman.....	4 00 per day	276 00	13 33	289 33
T. E. McGrath.....	Rodman.....	3 50 per day	3 50		3 50
W. R. Miller.....	Rodman.....	4 00 per day	16 00		16 00
M. B. Severance.....	Rodman.....	4 00 per day	148 00		148 00
W. J. Zabel.....	Rodman.....	4 00 per day	8 00		8 00
I. Grossman.....	Junior assistant engineer.....	1,030 per year	14 52		14 52
Abraham Oster.....	Junior assistant engineer.....	1,030 per year	150 87		150 87
Thomas F. Riley, Jr.....	Junior assistant engineer.....	1,030 per year	24 00		24 00
I. L. Stalker.....	Tracer.....	1,200 per year	20 00		20 00
E. J. Bullis.....	Chainman.....	3 00 per day	3 00		3 00
Harry Coniff.....	Chainman.....	2 50 per day	12 50		12 50
E. J. Greiner.....	Chainman.....	3 00 per day	3 00		3 00
William H. Saunders.....	Chainman.....	3 00 per day	33 00		33 00
Joseph H. Stutson.....	Boatman.....	3 00 per day	3 00		3 00
C. J. Collins.....	Laborer.....	2 00 per day	2 00		2 00
Kossuth Swartwood.....	Laborer.....	2 00 per day	4 00		4 00
<i>Incidental Expenses</i>			\$1,996 39	\$458 80	\$2,455 19
Livery.....				\$140 00	
Postage.....				10	
Office rent.....				120 00	
Miscellaneous.....				10 06	
Total.....					\$2,725 35

*Blue Line Surveys*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
B. E. Failing.....	Resident engineer.....	\$3,000 per year	\$125 00		\$125 00
Waldo G. Wildes.....	Resident engineer.....	3,000 per year		\$15 87	15 87
Frank V. Searis.....	Estimate clerk.....	1,800 per year	150 00		150 00
E. Quans.....	Office assistant.....	3 00 per day	12 00		12 00
W. J. Burns.....	Engineering draftsman.....	5 00 per day	455 00		455 00
A. B. Chappell.....	Engineering draftsman.....	5 00 per day	675 00		675 00
J. R. Eckhardt.....	Engineering draftsman.....	5 00 per day	90 00		90 00
Louis Kotewas.....	Engineering draftsman.....	4 00 per day	56 00		56 00
Tracy B. Smith.....	Engineering draftsman.....	5 00 per day	530 00	9 04	539 04
Charles R. Zorsch.....	Engineering draftsman.....	5 00 per day	390 00		390 00
O. L. Burdett.....	Assistant engineer.....	7 00 per day	203 00		203 00
L. G. Fisher.....	Assistant engineer.....	7 00 per day	217 00	8 16	225 16
A. S. Milinowski.....	Assistant engineer.....	7 00 per day	896 00	122 13	1,018 13
Elwin G. Speyer.....	Assistant engineer.....	2,208 per year	123 87	139 60	263 47
W. H. Ginnity.....	Leveler.....	5 00 per day	535 00		535 00
Powell Wall.....	Leveler.....	5 00 per day	90 00		90 00
Charles F. Keale, Jr.....	Junior engineer.....	1,440 per year	79 61		79 61
Wm. M. J. Lewis.....	Junior engineer.....	1,440 per year	600 00		600 00
Abraham Oster.....	Junior assistant engineer.....	1,110 per year	23 39		23 39
M. B. Severance.....	Junior assistant engineer.....	1,440 per year	86 97	2 46	89 43
D. J. Simpson.....	Junior assistant engineer.....	1,560 per year	45 97		45 97
C. J. Sullivan.....	Junior assistant engineer.....	1,320 per year	17 74		17 74
Harry J. Turner.....	Junior assistant engineer.....	1,110 per year	413 20		413 20

*Blue Line Surveys— (Continued)*

Chapter 646, Laws of 1916

NAME	Rank	Rate of compensation	Services	Travel	Total
C.E. Heydt.....	Rodman.....	\$4 00 per day	\$240 00		\$240 00
H. A. Ingersoll.....	Rodman.....	4 00 per day	16 00		16 00
L. John Long.....	Rodman.....	3 50 per day	94 50		94 50
George M. Harter.....	Masonry inspector.....	5 00 per day	110 00		110 00
Lynn H. Barrows.....	Engineering assistant.....	1,020 per year	100 71		100 71
Reginald S. Brackett.....	Engineering assistant.....	840 per year	334 33		334 33
W. F. Lysett.....	Engineering assistant.....	1,020 per year	112 71		112 71
Theo. Beaupre.....	Chainman.....	3 00 per day	132 00		132 00
Michael Bebarfeld.....	Chainman.....	2 50 per day	87 50		87 50
F. G. Hempel.....	Chainman.....	3 00 per day	603 00		603 00
P. M. Howe.....	Chainman.....	3 00 per day	591 00		591 00
Edward J. Moran.....	Chainman.....	2 50 per day	237 50		237 50
Wm. H. Saunders.....	Chainman.....	3 00 per day	84 00		84 00
C. Kumro.....	Boatman.....	3 00 per day	120 00		120 00
John Riley.....	Boatman.....	3 00 per day	570 00		570 00
Richard Stanton.....	Boatman.....	3 00 per day	591 00		591 00
Wm. A. Brck.....	Laborer.....	2 50 per day	82 50		82 50
Paul Buck.....	Laborer.....	2 00 per day	154 00		154 00
H. J. Killiam.....	Laborer.....	2 50 per day	21 50		21 50
Nelson Mullen.....	Laborer.....	2 50 per day	104 00		104 00
Matthew Rigney.....	Laborer.....	2 00 per day	140 00		140 00
John Zingierski.....	Laborer.....	2 50 per day	159 00		159 00
<i>Incidental Expenses</i>			\$10,500 00	\$297 26	\$10,797 26
Stationery and printing.....				\$68 16	
Livery.....				38 00	
Fuel and light.....				1 20	
Postage.....				24 25	
Office rent.....				282 00	
Telephone and telegraph.....				113 83	
Miscellaneous.....				575 30	
Total.....					1,102 74
Total.....					\$11,900 00

## SUMMARY

The foregoing tables are summarized as follows:

*Ordinary Repairs to Canals*

1. Erie canal, chapter 646, Laws of 1916..... \$10,000 00

*Construction of Barge Canal*

2. Erie canal, chapter 147, Laws of 1903, and amendatory laws ..... 127,788 75

*Construction of Barge Canal Terminals*

3. Barge canal terminals, chapter 746, Laws of 1911, and amendatory laws..... 26,890 43

*Special Work*

4. Chemung river improvement, chapter 732, Laws of 1913; chapter 728, Laws of 1915..... 36 66  
5. Canistota river improvement, chapter 750, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917..... 3,527 30  
6. Chadakoin river improvement, chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917..... 3,197 84  
7. Ellicott creek improvement, chapter 624, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917..... 320 99

*Special Surveys*

8. Surveys for State Court of Claims, chapter 646, Laws of 1916..... 2,725 85  
9. Blue line surveys, chapter 646, Laws of 1916..... 11,900 00

Total..... \$186,387 32

TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED  
JUNE 30, 1917  
*Special Work*

CONTRACTOR	Date of contract	Character of work	Act		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
			Chap.	Year				
Eastover Construction Co., Inc.	Oct. 18, 1915	Improvement of the Canisteo river, Steuben county.	780	1913	\$50,000 00	\$40,480 00	\$41,219 50	\$34,777 27
H. S. Kerbaugh, Inc.	Sept. 27, 1915	Improvement of Sawyers creek, Niagara county.	531	1914	10,000 00	8,000 00	9,440 00	8,980 22
Henry P. Burgard Co.	Feb. 14, 1916	Ordinary repairs — Making repairs to the dam at Tonawanda.	529	1914	.....	30,052 81	30,276 80	37,989 13

*Construction of the Barge Canal*

Chapter 147, Laws of 1903, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Central Dredging Co.*	Mar. 22, 1916	Contract No. 47-A, Erie canal — Completing canal, east line of Wayne county to Lyons.	\$1,038,469 00	\$726,034 30	\$193,720 00

\* Relet to complete former contract.

† This contract was canceled by the Canal Board March 22, 1917; the amount given is the value of work done as reported in the last monthly estimate.

TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED  
JUNE 30, 1917 — (Continued)

*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
William L. O'Day.....	Sept. 5, 1914	Erie canal — Construction of road N, adjacent to contract No. 19.....	.....	\$4,455 50	\$4,188 14
Myers & McWilliams.....	Nov. 4, 1915	Erie canal — Construction of culvert No. 30 at Iron-dequoit creek crossing.....	.....	.....	372,549 21

*Construction of Barge Canal Terminals*  
Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
I. M. Ledington's Sons, Inc. ....	Oct. 5, 1915	Terminal contract No. 47 — Raising dockwalls and paving at Tonawanda and North Tonawanda.....	\$44,000 00	\$38,361 80	\$36,045 92
Fred H. Rhodey.....	Feb. 16, 1916	Terminal contract No. 51 — Raising dockwalls and grading and surfacing site at Medina.....	6,379 00	5,325 00	4,362 65
J. B. McCabe & Son.....	Jan. 29, 1917	Terminal contract No. 206 — Temporary warehouses at Spencerport and Holley.....	1,630 00	1,446 00	1,397 50

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, JUNE 30, 1917  
*Special Work*

CONTRACTOR	Date of contract	Character of work	Act		Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
			Chap.	Year				
Frank L. Cohen*	Dec. 10, 1914	Improvement of Ellicott creek, Erie county.....	{	624 1913	\$80,000 00	\$69,867 71	\$65,328 75	\$41,140 00
Geo. L. Maltby.....	Mar. 23, 1916	Improvement of Chadakoin river, Chautauque county.....	{	728 1915 758 1913 728 1913	100,000 00	89,252 25	92,074 25	5,400 00

\* This contract was canceled by the Canal Board June 20, 1916, but the final account has not been approved.



TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, JUNE 30, 1917 — (Continued)

Construction of the Barge Canal

Chapter 147, Laws of 1903, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
H. S. Kerbaugh, Inc.	Nov. 3, 1916	Contract No. 19-A, Erie canal — Reddredging contract No. 19 and incidental work	\$152,230 00	\$109,750 10	\$0,890 00
Walsh Construction Co.*	Feb. 16, 1916	Contract No. 21-A, Erie canal — Completing canal, 400 feet west of Genesee river to N. Y. C. R. crossing	415,700 00	384,928 69	231,970 00
H. S. Kerbaugh, Inc.*	May 20, 1916	Contract No. 22-A, Erie canal — Completing canal, King's Bend, to Genesee river	651,703 10	627,568 42	142,250 00
MacArthur Bros. Co.	Nov. 3, 1916	Contract No. 59, Erie canal — Constructing canal between contracts Nos. 21-A and 23-A at Genesee river, and Rochester harbor	1,675,252 86	1,601,279 11	41,520 00
P. H. Murray	July 3, 1916	Contract No. 59-A, Erie canal — Sewer from Genesee Valley park, Rochester	124,260 55	110,689 45	71,140 00
State Highway Construction Co.*	Feb. 23, 1916	Contract No. 53-A, Erie canal — Completing canal, Wayne-Monroe county line to King's Bend	567,745 70	500,603 20	262,520 00
Lupfer & Remick	Mar. 9, 1917	Contract No. 84, Erie canal — Viaduct over Clyde river at Clyde	83,984 50	83,876 66	17,520 00
Tift Construction Co., Inc.	Nov. 24, 1916	Contract No. 98, Erie canal — Adams street lift-bridge, Lockport	77,496 60	82,276 25	20,250 00
Combined Construction Co.	April 19, 1917	Contract No. 138, Erie canal — Movable dam, etc., at Rochester	302,700 30	321,115 12	700 00
W. F. Maas & Son	Mar. 8, 1917	Contract No. 141, Erie canal — Power-station at lock No. 26, Palmyra	41,166 50	41,180 75	4,830 00
W. F. Martens & Co., Inc.	June 14, 1917	Contract No. 144, Erie canal — Two concrete bridges over Red creek, Genesee Valley park, Rochester	41,480 70	41,258 70	130 00
Lupfer & Remick	April 7, 1917	Contract No. 154, Erie canal — Additional Tainter gate, lock No. 27, Lyons	7,802 70	8,582 50	0.00
I. M. Ludington's Sons, Inc.	Mar. 27, 1917	Contract No. 159, Erie canal — Extending Ganargus creek railway and raising canal banks nearby	30,464 00	28,476 00	6,230 00
Chas. A. Ingersoll	Mar. 27, 1917	Contract No. 162, Erie canal — Drain at Main street, Brockport	6,173 90	7,208 30	6,240 00

\* Relet to complete former contracts.

*Special Work Connected with Barge Canal Construction*

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
Sherman-Stalter Co. ....	Mar. 27, 1917	Erie canal — Completing contract No. 47-A, east line of Wayne county to Lyons. ....	.....	.....	\$207,566 58

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*Construction of Barge Canal Terminals*  
Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1917
H. S. Kerbaugh, Inc. ....	Jan. 12, 1914	Terminal contract No. 21 — Harbor, piers, bulkheads, etc., in Erie basin, Buffalo. ....	\$1,513,925 00	\$801,972 30	\$560,120 00
Lupfer & Remick. ....	Sept. 30, 1916	Terminal contract No. 31 — Terminal at Lyons. ....	57,925 00	51,653 80	16,500 00
Fred H. Rhoady. ....	Mar. 23, 1917	Terminal contract No. 38 — Terminal at Albion. ....	2,700 00	2,952 50	2,100 00
M. H. Ripston. ....	Oct. 19, 1916	Terminal contract No. 48 — Terminal on east side of Genesee river, Rochester. ....	101,000 00	93,828 00	25,480 00
Walsh Construction Company. ....	Oct. 27, 1916	Terminal contract No. 53 — Terminal at Ohio basin, Buffalo. ....	571,800 00	532,584 00	11,090 00
Hammond-Tracy Construction Co., Inc. ....	Mar. 27, 1917	Terminal contract No. 54 — Terminal at Middleport. ....	1,250 00	1,234 00	640 00
E. Brown Baker. ....	Dec. 18, 1916	Terminal Contract No. 101 — Stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. ....	*21,800 90	*31,790 90	0 00
G. J. and P. L. Metzger. ....	June 4, 1917	Terminal contract No. 199 — Frame warehouses at Tonawanda and North Tonawanda. ....	7,802 00	7,535 00	480 00
Savage Construction Company. ....	June 1, 1917	Terminal contract No. 210 — Frame warehouses at upper and lower terminal sites at Lockport. ....	9,935 00	9,903 00	4,045 00
W. F. Martens & Co., Inc. ....	June 14, 1917	Terminal contract No. 211 — Frame warehouses at Newark, Albion and Medina. ....	8,800 00	8,002 00	2,280 00

\* Figures include portions on Eastern and Middle Divisions.

### SUMMARY OF CONSTRUCTION WORK — BARGE CANAL — WESTERN DIVISION

Value of work done under Barge canal contracts in the Western Division, summarized  
by years and sections

YEAR *	VALUE OF WORK DONE — ERIE CANAL				
	Section 8	Section 9	Section 10	Section 11	Totals
1905.....		\$59,190			\$59,190
1906.....		197,840			197,840
1907.....		172,400		\$20,180	192,580
1908.....		243,530	\$62,590	110,170	416,290
1909.....	\$118,500	914,629	798,040	180,950	2,012,119
1910.....	465,620	1,252,317	1,322,690	238,760	3,279,387
1911.....	1,249,020	1,966,094	1,917,240	153,070	5,285,424
1912.....	2,343,690	1,934,944	2,270,181	45,590	6,595,375
1913.....	1,496,780	1,604,897	2,247,057	31,750	5,380,484
1914.....	682,665	457,330	1,187,152	3,846	2,330,993
1915.....	54,199	108,946	313,232		476,377
1916.....	1,130	409,243	1,853		412,226
1917.....	428,737	720,631	20,250	9,890	1,179,508
Totals.....	\$6,840,341	\$10,041,991	\$10,140,285	\$795,176	\$27,817,793

#### Extra Work Orders Paid

1908.....				\$300	\$300
1909.....		\$5,353	\$1,373	3,738	10,464
1910.....		6,154	3,693	845	10,692
1911.....		163,130	12,375		175,505
1912.....	\$6,820	76,278	4,600	7,237	94,935
1913.....	24,171	149,322	17,279	12,805	203,577
1914.....	157,130	54,944	12,798	14,872	239,744
1915.....	9,707	4,086	7,161		20,954
1916.....			436		436
1917.....		7,433		1,460	8,893
Totals.....	\$197,828	\$466,700	\$59,715	\$41,257	\$765,500

\* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.

# WESTERN DIVISION: CONSTRUCTION WORK BY YEARS 355

## SUMMARY OF CONSTRUCTION WORK—BARGE CANAL TERMINALS — WESTERN DIVISION

Value of work done under Barge canal terminal contracts in the Western Division, summarized by years and sections

YEAR *	VALUE OF WORK DONE — ERIE CANAL				
	Section 8	Section 9	Section 10	Section 11	Totals
1913.....			\$22,410		\$22,410
1914.....			26,497	\$136,190	162,687
1915.....				202,990	202,990
1916.....		\$1,204	2,298	111,920	115,422
1917.....	\$16,760	26,179	12,372	157,236	212,547
Totals.....	\$16,760	\$27,393	\$63,577	\$608,336	\$716,056

Extra Work Orders Paid					
1916.....		\$150			\$150
1917.....			\$500	\$256	756
Totals.....		\$150	\$500	\$256	\$906

\* The years 1913 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; and 1917 is a twelve-month period, ended June 30.



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## REPORT OF TESTS

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## REPORT OF THE LAND BUREAU

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## REPORT OF TESTS

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TESTING LABORATORY — GEOLOGICAL HALL

ALBANY, N. Y., July 2, 1917.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor*:

Sir.—I have the honor to submit the following report of the testing laboratory of your Department for the fiscal year ended June 30, 1917.

The work of the laboratory during the past year has been even more varied than the year before, for, besides the regular testing of cement, sand, gravel, concrete, paints, oils, etc., and the frequent field inspections of concrete and concrete materials, the testing and analyses of several new materials have been added. Also many special tests of considerable variety have made the work of particular interest and value. Some special inspections have also been the means of securing valuable data. This laboratory has made good use of the opportunity to coöperate in some general research work relating to the cementitious qualities of hydraulic cements and to the qualities of other concrete materials, and the results of this work have brought special recognition to the laboratory. Some very valuable data have been secured for the use of this Department and this new data will help greatly in establishing the true relations existing between the cement and the sand and gravel or stone to be used in the various works.

### CEMENT TESTS

The work of testing cement has been not only to test that for use on the work of the Barge canal and the Barge canal terminals but has also been testing for other work under the direction of this Department, the Department of Architecture, and several other State departments. During the year there have been submitted to this laboratory and tested 4,489 samples of cement, representing 245,102 barrels of cement, of which 92.8 per cent were for the State Engineer's Department and 7.2 per cent for the State Architect. It was found that for promptness of inspection and delivery as well as economy it was advisable to permit



shipments frequently to the State Architect and to other State work from some bin of cement which had been tested and accepted for use on Barge canal work. Considerable cement was so shipped under our inspection.

The inspection of cement at the mills has been a large part of the work of this bureau. Such inspection permits the taking of a smaller portion of samples to the number of barrels represented. In addition to the saving in time and number of necessary samples, mill inspection prevents the delivery of any cement upon the work except that which has been tested and accepted. Notwithstanding these advantages there has been more cement sampled after delivery upon the work this year than for many years past. This is due largely to the effort of some contractors to save a per-barrel charge on bin-tested cement.

Each sample submitted, mixed in the proportion of one part cement to three parts standard quartz sand, was tested for tensile strength at 7- and 28-day periods. In addition to the tests for tensile strength, each lot of samples was given tests for fineness of grinding, for initial and hard sets, for specific gravity and for soundness by means of the steam tests, the normal-water test and the normal-air test. Frequently the cements were completely analyzed and are especially checked for sulphuric anhydride ( $\text{SO}_3$ ) and magnesia ( $\text{MgO}$ ).

The methods used in making the tests and analyses of cements are practically those recommended by the Committee on Cement of the American Society for Testing Materials and adopted during the past year by that society as standard. A slight variation from that method is that, instead of using a blended sample for tests for tensile strength, we still use our own method of testing each sample separately for tensile strength. This method has long proven very satisfactory; in fact, by means of it, much poor cement has been discovered which would have stood the tests, had all of the samples of a lot been blended. It has been a special help in securing from the mills a cement that is uniform in quality. This method, however, makes necessary a larger equipment and a more complete system of operation than is necessary under the general method of testing the blended sample. The effort has been made to maintain this complete laboratory with as little expense as possible; and it has been acknowledged that

the laboratory and its results are as complete and satisfactory as any laboratory making such large numbers of tests of cement.

The specifications for cement have followed closely for years those recommended by the American Society for Testing Materials, varying from them only in some details. One of these variations has been that the specifications call for tests for tensile strength with standard crushed quartz sand instead of the present generally accepted Ottawa sand. When the specifications for the construction of the Barge canal were first written, it was at a time when the Ottawa sand was being first adopted as a general standard, but when it was not possible to secure the Ottawa sand in such large quantities as was needed by this laboratory, so the specifications were written for use of standard crushed quartz sand. It was later decided to continue the original specification in this respect until near the completion of the Barge canal work. In June, 1917, this work was so near completion that it was decided to use the specifications of the American Society for Testing Materials for cement on all new contracts. Now, accordingly, for such new contracts, for the work under the direction of the State Architect and for work under other State departments where these specifications are used, Ottawa sand is being used in making the tests. Considering the part a representative of this laboratory had in the final development of the new specifications, this change was both logical and consistent.

At the end of the 7-day tests, all results obtained on tests of samples of cement proposed for use on Barge canal work are reported to Mr. D. B. LaDu, Special Deputy State Engineer, and, if then thought best, are held for the 28-day tests, the lots being accepted or rejected according as the results show that the cement passes or fails to pass the tests. The reports of all tests of cement for all other department work (except Barge canal) are submitted to the Deputy State Engineer William B. Landreth.

This laboratory has also been making a thorough study of the proposition to substitute compression tests of cement for the present tension tests and it is securing data which will help toward a wise decision on this question.

Of the cement tested and proposed for use, all was Portland cement. The brands represented are more than of recent years. Of the brands tested, 7 were manufactured in New York, 13 in Pennsylvania and 3 in New Jersey.

The method of inspection of cement at the various mills is as follows: When there is to be enough cement to warrant doing so, an inspector is sent to the cement mill to sample cement and inspect shipments. The inspector takes samples from the various parts of the bin or from the conveyor as the cement is being carried to the bin, and each sample is tested in the same way as are the samples taken from cement delivered on the work. The endeavor is to obtain from the sampling and the testing of these samples the "run of the product." As soon as the samples are taken, the inspector places the bin of cement under the seal of this Department and the bin is so sealed that no cement can be added to or taken from it without detection. When the results of the tests have been secured, the reports are made in the usual way, and then, if the cement is accepted, the bin of cement is assigned to the contract which may have placed an order for the cement. When the contractor needs cement, the inspector at the mill breaks the seal on the bin, inspects the loading of the car or cars, seals these with the Department seal and then reseals the bin of cement. A notice of shipment is forwarded to the laboratory. This is examined and approved, if correct, and is sent to the senior assistant engineer in charge of the contract to which the cement has been assigned. When the car or cars arrive on the work, the seal of the Department must be broken by the senior assistant engineer in charge or his representative, otherwise the lot of cement must be sampled and tested in the usual way.

#### SAND TESTS

The thorough examination and tests of the sands and gravels proposed for use on work in the various departments have been continued, and the importance of such tests has frequently been fully demonstrated. It has been found that almost all of the available sand and gravel banks along the line of the canal system have been sampled and tested, but with these it is now necessary to make occasional inspections and tests to ascertain whether or not the quality of the materials from these banks is equal to the samples accepted. Many other banks throughout the state, but not along the canal system, have also been tested. The results of the tests of these materials have also been found to be of value by other State departments.

The tests made are as follows: The sands are examined under the microscope for those elements that give the sand its characteristics. The other tests are for voids, loam, fineness or grading, and strength — both tensile and compressive — with cement. The latter are made from the sand in its natural condition and also washed; and the cement is a "standard" cement, made by mixing together in the laboratory several brands of cement which have given results nearly alike in the regular tests. All tests for strength cover at least 28 days, but many long-time tests are being carried. Considerable attention has been given to the methods used in making the tests and it is believed that they are the most accurate that can be employed.

The proposed new test for determining the effect of coatings on sand grains is being tested and given a thorough study. This test, if proven efficient, should give information in the testing of sands that will be of great value.

The testing of sand includes also the testing and examination of the gravel in the sand and also the testing of substitutes for sand and gravel, such as screenings, iron-ore tailings and slag.

#### CONCRETE TESTS

When in July, 1912, a hydraulic compression machine with a capacity of 200,000 pounds was placed in the laboratory, the Division Engineers were notified that engineers in charge of work could take advantage of this machine and from time to time make cubes of concrete as it was being placed in the work. Six-inch cubes or cylinders of eight inches diameter and sixteen inches long can be tested in this machine. The plan generally followed is to mold the test piece from concrete mixed by the contractor for actual use in the work, keep it covered with a moist canvas for seven days, then allow it to be exposed under regular atmospheric conditions until the test-piece is twenty-one days old, when it is crated and sent to the laboratory for tests. The tests are made on these sample blocks when twenty-eight days old. The blocks are made in duplicate at least. In accordance with the newer practice, laboratory concrete specimens are being molded in cylinders where the length is twice the diameter. The cylinders generally give more uniform results than do the cubes.

## OTHER TESTS

Besides those already reported, there have been made a large variety of other tests and analyses. Among the materials thus examined were stone, wooden and granite paving blocks, paving brick, bituminous materials, metal lath, hollow-tile, galvanized conduit, waterproofings of various types, dynamo oils, wood preservatives and paints. On these latter considerable work has been done. Another material submitted for testing has been linoleum and these tests have been both interesting and profitable. Considerable research work has been continued on laitance and on the efflorescence and incrustations on concrete, and microscopic examinations and analyses in the laboratory on these materials have been also continued. Additional apparatus has been installed to care for the above variety of work.

In addition to directing the work of the laboratory and mill inspection, the undersigned has made field inspection of the concrete and concrete materials being used on many of the Barge canal contracts where concrete was being placed. Particular attention has been given to the source of supply of the gravels, sand and stone being used in the concrete. A more definite knowledge is thus gained than is possible through a laboratory sample alone, but with both tests and field inspection absolute knowledge is gained. Inspection of its actual use is also a help in considering the points of merit or demerit in the material. Inspections of concrete that has been in place for some time have been made, to study the condition and the wear of the concrete for the purpose of securing information on the various theories that have been advanced from time to time on the changes that may take place in concrete. Some interesting and profitable studies have thus been made.

The development of the specifications and methods of tests of materials of construction is a natural sequence of the knowledge secured in the analyses, tests and inspections, so this has frequently been a valuable feature we have been called upon to do.

Respectfully submitted,

RUSSELL S. GREENMAN,

*Senior Assistant Engineer, in charge of Tests.*

# REPORT OF THE LAND BUREAU

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STATE OF NEW YORK  
DEPARTMENT OF STATE ENGINEER AND SURVEYOR  
LAND BUREAU

ALBANY, N. Y., *July 2, 1917.*

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir.—Herewith I submit a report of the work of the Land Bureau for the fiscal year ending June 30, 1917.

A part of the work has been the examination and report, as to their engineering features of the applications to the Commissioners of the Land Office, for grants of land under water. Thirteen applications for restricted beneficial enjoyment were examined. Six petitions were made for an extension of time wherein to fulfill the terms of the grant.

Maps showing all the water grants are on file in this bureau and new grants are added to the maps, when made by the Land Board. These maps are complete to January 1, 1917.

The sale of State land that is ordered sold by the Commissioners of the Land Office is conducted by this bureau. Sixteen public auctions were held and the sum of \$7,890.80 realized therefrom. A detailed statement of the sales is appended.

The early records, maps and field notes filed in this bureau are being constantly examined by the public and are of great and increasing value.

Respectfully submitted,

MERRITT PECKHAM, JR.

*Land Clerk.*

TABLE OF SALES CONDUCTED BY THE LAND BUREAU DURING THE  
FISCAL YEAR ENDED JUNE 30, 1917

Date of sale	Purchase	Location — county	Lot	Acres	Tax or mortgage	Price
1916						
July 5	J. E. Bennett and one.....	Kings.....	1 city lot.....		Tax.....	\$46 00
July 7	Alfred A. McCreary.....	Rockland.....	23 marsh lots.....		Tax.....	1,134 00
July 11	John E. Griffith.....	Oneida.....		102	Mortgage.....	1,038 00
July 12	Joseph Houser.....	Richmond.....	2 city lots.....		Tax.....	38 50
July 12	Catherine Stewart <i>et al.</i> .....	Richmond.....		1½	Tax.....	61 00
Aug. 30	Ann Dingman McCoy.....	Rockland.....	3 village lots.....		Tax.....	132 00
Aug. 30	Leon J. Pallez and two.....	Rockland.....	5 village lots.....		Tax.....	315 00
Aug. 30	Morris Greenberg.....	Rockland.....	3 village lots.....		Tax.....	138 00
Sept. 12	E. L. Osterhoudt.....	Ulster.....	1 city lot.....		Escheat.....	1,020 00
Sept. 14	Frank Williams.....	Oswego.....		50	Tax.....	521 00
Oct. 25	Nicola M. Marinelli.....	Richmond.....	2 city lots.....		Tax.....	37 00
Oct. 31	Alfred A. McCreary.....	Rockland.....	6 marsh lots.....		Tax.....	297 35
Nov. 3	Louisa C. Corliss.....	Oneida.....		100	Mortgage.....	840 00
Nov. 22	Frank and Wm. Hamlin.....	Erie.....	1 city lot.....		Escheat.....	387 00
Dec. 27	Frank Rondeau.....	Essex.....	1 village lot.....		Tax.....	21 00
1917						
Jan. 31	J. and G. W. Johnson.....	Richmond.....		2½	Tax.....	113 00
Feb. 21	John W. Olmstead.....	Niagara.....	7 city lots.....		Tax.....	138 70
Mar. 13	F. Walter Tarbox.....	Chautauqua.....		83	Mortgage.....	1,087 25
Mar. 29	Philip C. Correll and wife.....	Columbia.....		145	Mortgage.....	526 00
	Total.....					\$7,890 80

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## **BOUNDARY LINE REPORTS**

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**Report on Examination of New York-Canadian Boundary  
Line Monuments**

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**Report on Clearing Line and Repairing Monuments on  
the New York-Canadian Boundary Line**

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**Report on Clearing Sections of the New York-Massachu-  
setts Boundary Line**

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**Report on Monumenting Town Line Intersections on the  
New York-Massachusetts Boundary Line**

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**Report on Examination of New York-Pennsylvania  
Boundary Line Monuments**

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These places should be cleared. The most necessary points lie between monuments Nos. 655 and 657, 661 and 668, 676 and 679, 682 and 695, 755 and 759, and 762 and 764.

When triangulation is undertaken, as is planned by the International Boundary Commission for next summer, the mapping should be done for at least one mile on each side of the line on a scale of about two inches to the mile, showing 10-foot contours. The existing maps do now show sufficient detail to be of much value in locating the monuments.

A note-book and typewritten descriptions of the condition and location of all monuments have been filed in the State Engineer's office.

Respectfully submitted,

H. F. EAGAN,

*Representing New York State.*

## Clearing Line and Repairing Monuments on the New York-Canadian Boundary Line

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ALBANY, N. Y., July 31, 1917.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor*:

Sir.—I submit herewith a report on work done on New York-Canadian boundary line from May 22 to July 31, 1917

Sections of the line which had been overgrown since the survey of 1902 were cleared to a width of ten feet. The sections cleared were between monuments Nos. 656 and 657, 663-A and 667, 676 and 678-A, 684 and 695-A, 726 and 727, and 755 and 760.

Monuments that were heaved by frost and leaned in various directions were plumbed up and placed in their true position and reset in a concrete base 6 feet square and 4½ feet deep. The monuments reset were Nos. 770, 765, 761, 760, 753, 751-A, 739, 738, 736, 722-A, 713, 710, 709, 700, 650 and 648.

Monuments whose bases were chipped and cracked were repaired by chipping the surface of base off for 3 inches and retopping and restamping them. Monuments so treated were Nos. 751-A, 709, 708, 688, 667, 663 and 658.

Monument No. 721, which had been broken, was replaced with a new monument.

A new monument was set between monuments Nos. 726 and 727 and marked 726-A. This monument was set on the east side of a cross road and opposite a line store. The monument is 1,576.45 feet east of monument No. 727.

Respectfully submitted,

H. F. EAGAN,

*Junior Assistant Engineer.*

### Clearing Sections of New York-Massachusetts Boundary Line

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ALBANY, N. Y., July 31, 1917.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor*:

Sir.—I beg leave to submit herewith a report on the recutting of sections of the New York-Massachusetts boundary line.

On July 6, 1916, I and four axmen started clearing at monument No. 1 and cleared sections between monuments Nos. 1 and 4, 9 and 12, 14 and 17, 46 and 49, 68 and 70, 91 and 105, and 106 and 112, finishing August 24, 1916.

Between monuments Nos. 1 and 4, 9 and 12, and 14 and 17 the line was overgrown with scrub oak and laurel. These sections were hard to cut, taking 21 days to clear 20,825 linear feet. The remaining sections were overgrown with saplings and we had no difficulty clearing them, clearing 64,029 linear feet in 22 days.

All monuments are now easily accessible.

Respectfully submitted,

H. F. EAGAN.

**Report of Town Line Intersections Monumented on the  
State Line between the State of New York and  
the Commonwealth of Massachusetts**

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ALBANY, N. Y., July 31, 1917.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor*:

Sir.—I submit herewith a report on monumenting town corners on the New York–Massachusetts boundary line.

*Intersection of the New Lebanon–Stephentown Town Line with  
the New York–Massachusetts State Line*

The monument marking the town corners of New Lebanon and Stephentown was the first monument set. This corner was located from an old stone pile of the 1787 survey. This old stone pile lies slightly east of true line as run in 1898. This monument now is 415.15 feet southerly from monument No. 82, which makes it 176,379.85 feet northerly from the Three-States stone.

*Intersection of the Canaan–New Lebanon Town Line with the New  
York–Massachusetts State Line*

The monument marking the town corners of Canaan and New Lebanon was next set,  $5\frac{3}{4}$  miles south of the New Lebanon–Stephentown corner, as called for in the N. Y. Laws of 1818, 41st session, page 310. This monument is 146,019.85 feet northerly from the Three-States stone.

*Intersection of the Stephentown–Berlin Town Line with the  
New York–Massachusetts State Line*

The monument marking the town corners of Stephentown and Berlin was set from the location obtained from J. P. Thomas from a survey of the town lines made May 10, 1910. This monument is 221,376 feet northerly from the Three-States stone.

*Intersection of the Berlin-Petersburg Town Line with the New  
York-Massachusetts State Line*

The monument marking the town corners of Berlin and Petersburg was set from information obtained from J. P. Thomas. This monument is 256,608 feet northerly from the Three-States stone.

The work started April 19, 1917, and was completed May 19, 1917.

Respectfully submitted,

H. F. EAGAN,  
*Junior Assistant Engineer.*

## New York-Pennsylvania Boundary Line Examination

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ALBANY, N. Y., *October 1, 1917.*

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir,—The following is a report on the examination of the monuments marking the boundary line between the states of New York and Pennsylvania.

On August 14 we started the examination at the first monument, near Hale Eddy on the Delaware river, and continued west, arriving at the Bluff monument on Lake Erie September 21.

The monuments marking this line are of six classes, as follows:

### *First Class — Highway Monuments*

These are placed at highways intersecting or following the boundary line. Mile-stones placed alongside highways are of this class. These monuments are four and one-half feet long; the top of each is dressed in the form of a rectangle of twelve inches by six inches; at right angles across the center, parallel with the edges, are cut two quarter-inch grooves; the upper end of each side of the monument is also dressed to a depth of twelve inches and upon the north face are cut the letters "N. Y." and upon the south, the letters "Pa." The mile-stones of this class are further marked with the number of the original mile and the letter "M." In setting monuments of this class the longer groove was placed in the direction of the boundary.

### *Second, Third and Fourth Classes*

Monuments of these classes are four feet long; the top is dressed six inches square and the upper end of each side is also dressed to a depth of six inches.

Monuments of the second class are placed at such original mile points as are not marked by monuments of the first or fourth classes. Across the top at right angles and parallel with the

faces are cut two quarter-inch grooves; on opposite faces are cut the letters "N. Y." (north) and "Pa." (south), and upon a third (east) face, the number of the original monument with the letter "M" under it.

Monuments of the third class are similar in all respects to monuments of the second class, with the exception that the number upon the face is omitted. They are placed at railway and river intersections and at such other points as were deemed necessary. Monuments of the second and third classes are set so that the faces containing the letters "N. Y." and "Pa." are parallel with the boundary.

Monuments of the fourth class have cut diagonally across their tops two quarter-inch grooves, and they are set so that one of the diagonal grooves is in the direction of the boundary. These monuments are generally mile-stones, marking the town or county corners; the faces of the stone towards the town or county are marked with the initial letter of the name.

#### *Fifth Class*

Monuments of this class are placed to mark the astronomical stations which the United States Coast and Geodetic Survey occupied in 1877 and 1879. Each monument is a block of granite twelve inches square and eighteen inches or more deep. The top is dressed and the station point is marked upon it in the center by a cross (X). Upon the top are also cut the name of the station, the letters "U. S. C. & G. S." and the year in which the station was occupied. The monuments of this class were not examined, as they are all buried beneath the surface.

#### *Sixth Class*

These monuments are made from a 5-foot section of a 5-inch by 3-inch I beam, on the bottom of which is bolted a plate whose dimensions are  $\frac{1}{4} \times 8 \times 10$  inches. On the north and south faces of the monuments are riveted two nickel plates bearing the words "NEW YORK" and "PENNSYLVANIA," respectively.

The report of the State Engineer for the year 1906 gives a detailed description of the location of each monument.

During our examination we found many monuments which have been heaved by frost and should be reset. Also two monuments which were broken and should be replaced with new ones. The monuments that should be reset are Nos. 38, 45, 50, 51, 59, 61, 62, 68, 73, 79, 87, 93, 118, 142, 169, 183, 187, 198, 236, 262, 296, 310, 434 and 25. New monuments to be set are Nos. 303 and 44.

The monuments from No. 392 to No. 416, inclusive, which are located between Tuna Valley and Corydon, known as the wilderness, were not examined. The examination of 1906 reported the monuments as being in good condition in that portion of the line. No effort was made to go over this portion of the line, as it consists chiefly of thick, dense briars, underbrush, laurel, rocks, fallen timber, etc., there being no indication of the line and no possible way of travel.

Many other portions of the line are overgrown and should be recut. I would estimate that at least seventy-five miles of line are in need of recutting.

Railroad representatives are careless in allowing the monuments to be buried in the railroad embankments. Highway commissioners allow the earth to be scraped away from the highway monuments without any just cause and also without notice to the proper authorities.

Since the monuments marking this line are so small, they are very difficult to locate in the woods. Some highway monuments cannot be seen two feet away. Some are buried. Nearly all are chipped and they do not conform to the monuments marking the other boundaries of the state. Since the survey of 1884, new highways have been built, and railroads and trolley lines cross the boundary which do not show on our map. Some highways which do show have been abandoned and hardly a trace is left of them.

Rather than repair the old monuments I recommend that the line be rerun and remonumented with new monuments of the same design as are used on the other boundaries of the state; that topography be taken for a half-mile each side of the line and



that a vista be cut 20 feet wide through the woods. The following is an estimate of the probable cost of this work.

Running line.....	\$2,600
Vista cutting .....	10,875
Topography .....	35,964
Monuments .....	9,480
Setting monuments .....	12,772
Plotting, computing, etc.....	3,000
<hr/>	
Total .....	\$74,691
<hr/>	

Say, \$75,000.

The figures are based on the following details:

*Running Line.*

Party—1 transitman at \$4.00 per day.....	\$4.00
2 chainmen at \$3.00 per day.....	6.00
<hr/>	
	\$10.00
243 miles at the rate of 2 miles per day = 121½ days.	
Say 130 days at \$10 per day.....	\$1,300
Expenses of party—3 men at \$2.00 per day.....	\$6.00
Transportation per day.....	4.00
<hr/>	
	\$10.00
130 days at \$10 per day.....	1,300
<hr/>	
Total for line running.....	\$2,600
<hr/>	

*Vista Cutting.*

Party—1 foreman at \$5.00 per day.....	\$5.00
4 axemen at \$2.50 per day.....	10.00
<hr/>	
	\$15.00
75 miles of cutting at 5 days to the mile = 375 days.	
375 days at \$15 per day.....	\$5,625
Expenses of party—5 men at \$2.00 per day.....	\$10.00
Transportation per day.....	4.00
<hr/>	
	\$14.00
375 days at \$14 per day.....	5,250
<hr/>	
Total for vista cutting.....	\$10,875
<hr/>	

**Topography.**

Party—2 topographers at \$5.00 per day.....	\$10.00	
2 rodmen at \$3.00 per day.....	6.00	
2 axemen at \$2.50 per day.....	5.00	
	<u>\$21.00</u>	
243 miles at the rate of $\frac{1}{4}$ mile per day = 972 days.		
972 days at \$21 per day.....		\$20,412
Expenses of party—6 men at \$2.00 per day.....	\$12.00	
Transportation per day.....	4.00	
	<u>\$16.00</u>	
972 days at \$16 per day.....		15,552
Total for topography.....		<u>\$35,964</u>

**Monuments.**

250 granite monuments at highways at \$25.00 each.....	\$6,250	
323 iron monuments at \$10.00 each.....	3,230	
	<u>\$9,480</u>	

**Monument Setting.**

Granite monuments set at the rate of 1 per day....	250 days	
Iron monuments set at the rate of 2 per day.....	162	
	<u>412 days</u>	
Party—1 foreman at \$5.00 per day.....	\$5.00	
4 laborers at \$2.50 per day.....	10.00	
1 team at \$6.00 per day.....	6.00	
	<u>\$21.00</u>	
412 days at \$21 per day.....		\$8,652
Expenses of party—5 men at \$2.00 per day.....	\$10.00	
412 days at \$10 per day.....		4,120
Total for monument setting.....		<u>\$12,772</u>

Respectfully submitted,

H. F. EAGAN.



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